STONEX

Stonex® R9

Technical Reference Manual
Version 1.0

Introduction

Purchase

Congratulations on the purchase of a R9 instrument.

To use the product in a permitted manner, please refer to the detailed safety directions in the User Manual.

Product identification

The type and the serial number of your product are indicated on the type plate.
Enter the type and serial number in your manual and always refer to this information when you need to contact your agency or Stonex® authorized service workshop.

Type: _____

Serial No.: _____

Symbols

The symbols used in this manual have the following meanings:

Type	Description
	Important paragraphs which must be adhered to in practice as they enable the product to be used in a technically correct and efficient manner.

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Validity of this manual

This manual applies to Stonex® field software running on R9 instruments.
Due to the different instruments and equipment, some parts of the manual may not be valid.
Where there are differences between the instruments they are clearly described.

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1 Instrument Protection with PIN

Description

- The instrument can be protected by a **P**ersonal **I**dentification **N**umber.
- If the PIN protection is activated, the instrument will always prompt for a PIN code entry after starting up and before **R9 Main Menu** comes up.
- If a wrong PIN has been typed in five times, a **P**ersonal **U**nbloc**K**ing code is required.
- Refer to "17.6 Start Up & Power Down" for information on activating PIN protection.
- This chapter explains the workflow of entering PIN and PUK.

Access

- **R9 Enter Security PIN Code** is automatically accessed during starting up the instrument when **<Use PIN: Yes>** in **CONFIGURE Start Up & Power Down**, **PIN Code** page and a PIN has been defined before. Refer to "17.6 Start Up & Power Down".
- **R9 Enter Security PUK Code** is automatically accessed during starting up the instrument when a wrong PIN code has been typed in five times.

R9
Enter Security PIN Code

OK (F4)
To accept the PIN code and to continue with the subsequent screen.

SHIFT QUIT (F6)
To turn off the instrument.

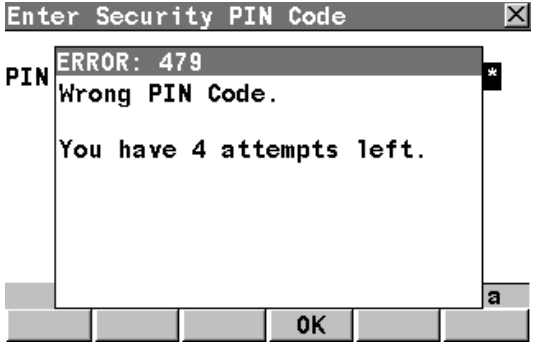
Description of fields

Field	Option	Description
PIN Code	User input	The PIN code as previously defined in **CONFIGURE Start Up & Power Down**, **PIN Code** page. The correct PIN code must be typed in within five attempts or the PUK code is required.

Next step

IF the PIN code entered is	THEN
correct	**R9 Main Menu** is displayed. Refer to "5 Main Menu".
wrong	refer to paragraph " R9 Enter Security PIN Code Error: 479".
wrong the fifth time	the PUK code is required. Refer to paragraph " R9 Enter Security PIN Code Error: 478".

R9
Enter Security PIN Code
Error: 479

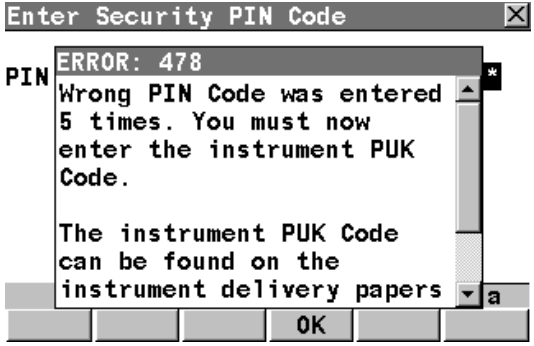


OK (F4)
To return to **R9 Enter Security PIN Code** where a PIN code can be typed in again.

Next step

IF the PIN code entered is	THEN
correct	**R9 Main Menu** is displayed. Refer to "5 Main Menu".
wrong the fifth time	the PUK code is required. Refer to paragraph " R9 Enter Security PIN Code Error: 478".

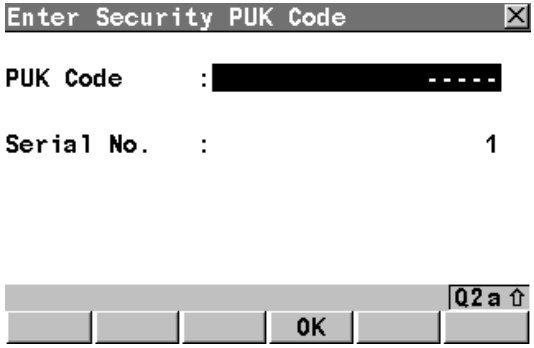
R9
Enter Security PIN Code
Error: 478


Enter Security PIN Code
PIN
ERROR: 478
Wrong PIN Code was entered 5 times. You must now enter the instrument PUK Code.
The instrument PUK Code can be found on the instrument delivery papers
a
OK

OK (F4)
To continue with the subsequent screen.

Next step
OK (F4) to access **R9 Enter Security PUK Code**.

R9
Enter Security PUK Code



OK (F4)
To accept the PUK code and to continue with the subsequent screen.

SHIFT QUIT (F6)
To turn off the instrument.

Description of fields

Field	Option	Description
PUK Code	User input	The PUK code as generated by Stonex®. The PUK code comes with the instrument.
Serial No.	Output	The serial number of the instrument. This is needed to obtain PUK from Stonex®.

Next step

IF the PUK code entered is	THEN
correct	the old PIN code is cleared and the PIN protection is deactivated. **R9 Main Menu** is displayed. Refer to "5 Main Menu".
wrong	R9 keeps asking for the correct PUK code. **SHIFT QUIT (F6)** to turn off the instrument.

2 USER Key

Description

The **USER** key opens the user defined menu.

User defined menu

The user defined menu can be configured to contain the most used functions or application programs. The user defined menu can not be accessed while in a **CONFIGURE XX** screen. Refer to "17.3 User Menu" for the configuration of the user defined menu.

Functionality of the user defined menu

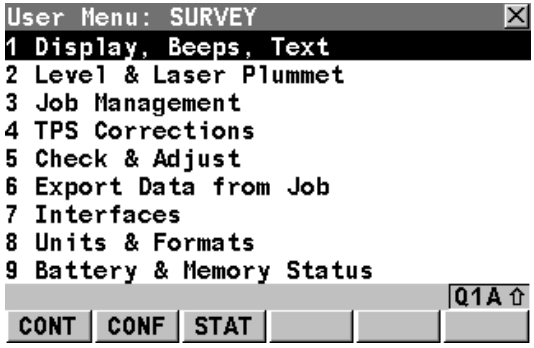
Selecting an option in the menu carries out the function or starts the application program assigned to the option.

Access

Press **USER** to access **R9 User Menu: Job Name**.

R9 User Menu: Job Name

This is an example of what a user defined menu can look like. The softkeys and their order is fixed. The functions and application programs which are assigned to the individual places in the user defined menu can differ depending on the configuration.



CONT (F1)
To execute the selected function.

CONF (F2)
To configure the user menu.

STAT (F3)
To access the **Status Menu**.

Define user menu step-by-step

This step-by-step description shows how to assign the **CONFIGURE Coding & Linework** screen to the first line of **R9 User Menu: Job Name**.

Step	Description
1.	Select **Main Menu: Config...\General Settings...\User Menu**.
2.	**CONFIGURE User Menu** Select **User Menu: <1: CONF Coding & Linework Settings>**.
3.	**CONT (F1)**
4.	Press **USER** and 1 to access **CONFIGURE Coding & Linework**.

3 Quick Settings - SHIFT USER

3.1 Overview

Description

Frequently used settings can be accessed quickly and changed with three key strokes. For example press **SHIFT USER** and **1** to turn the iLock on or off. The change is immediately applied and the screen where **QUICK SET Change Settings to:** was accessed from opens. The workflow is not interrupted.

This screen displays the possible settings to change to. All possible settings have two states and allow very quick setting changes. Highlight a field and press **ENTER** to change to the displayed setting or press the number next to the function.

Changes made on the **QUICK SET Change Settings to:** screen are stored in the active configuration set.

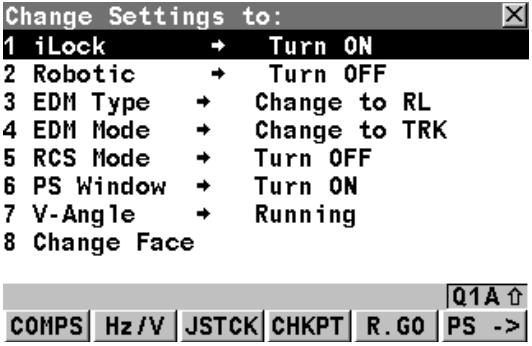
3.2 QUICK SET Change Settings to:

Access

Press **SHIFT USER**.

QUICK SET Change Settings To:

Refer to "29 Functions" for information on functions and to "16 Config...\Instrument Settings..." for information on instrument settings.


Change Settings to:
1 iLock → Turn ON
2 Robotic → Turn OFF
3 EDM Type → Change to RL
4 EDM Mode → Change to TRK
5 RCS Mode → Turn OFF
6 PS Window → Turn ON
7 V-Angle → Running
8 Change Face
Q1A
COMPS
Hz/V
JSTCK
CHKPT
R.GO
PS ->
COMPS (F1)
To turn the instrument using compass readings.
Hz/V (F2)
To turn the instrument to a specific entered position.
JSTCK (F3)
To turn the instrument using the arrow keys.
CHKPT (F4)
To check a point or the instrument orientation.
R.GO (F5) or R.INT (F5)
R.GO (F5) to start an iLock search, to set <Automation: iLock> and to lock onto the reflector.
R.INT (F5) to interrupt Robotic.

Description of fields

Field	Option	Description
iLock	**→ Turn ON**	To activate iLock, **<Automation: iLock>.**
	→ Turn OFF	To deactivate iLock, **<Automation: None>**.
Robotic	**→ Turn ON**	To activate Robotic, **<Automation: Robotic>**.
	→ Turn OFF	To deactivate Robotic, **<Automation: None>**.

Field	Option	Description
EDM Type	**→ Change to IR**	To activate measurements to reflectors, **<EDM Type: Reflector (IR)>**.
	→ Change to RL	To activate reflectorless measurements, **<EDM Type: Reflctrless (RL)>**. Deactivates iLock and Robotic, **<Automation: None>**.
EDM Mode	**→ Change to TRK**	To activate tracking with continuous measurements, **<EDM Mode: Tracking>**.
	→ Change to STD	To activate single measurements, **<EDM Mode: Standard>**.
V-Angle	**→ Hold**	The displayed value for the vertical angle is held after **DIST (F2)** and until **REC (F3)** is pressed, **<V-Angle: Hold after DIST>**.
	→ Running	The displayed value for the vertical angle is updated after **DIST (F2)** is pressed, **<V-Angle: Running>**. ☞ Be aware that after restarting the instrument this setting remains and is not changed.
Change Face	no choices	To change the face of the telescope.

Next step

IF	THEN
a setting is to be changed	type the selection number in front of the item or highlight the item and press **ENTER**.
the instrument is to be automatically turned to a specific position	**COMPS (F1)**, **Hz/V (F2)** or **JSTCK (F3)** to access the subsequent screen. Refer to "3.3 Quick Setting Functions".
a point or the instrument orientation is to be checked	**CHKPT (F4)** to access the **QUICK SET Check Recorded Pt/Backsight Pt** screen. Refer to "3.3 Quick Setting Functions".
prism is to be locked onto	press **R.GO (F5)** to activate Robotic and start an iLock search. Refer to "3.3.5 Robotic".
Robotic is to be interrupted	press **R.INT (F5)** to interrupt Robotic. Refer to "3.3.5 Robotic".

3.3 Quick Setting Functions

3.3.1 Orientation With Compass

Description

By using a conventional magnetic compass while remotely controlling the instrument, it is possible to determine the general direction towards which the instrument should turn in order to perform a target search to locate the prism.

Access

Press **COMPS (F1)** in the **QUICK SET Change Settings to:** screen. Refer to "3.2 QUICK SET Change Settings to:".

The instrument must be connected to a radio to be remote controlled with a controller.

Orientation with compass step-by-step

The following table explains the most common settings. Refer to the stated chapter for more information on screens.

Step	Description	Refer to chapter
1.	**ON**. Select Setup application program to set up the instrument.	33
2.	**Main Menu: Survey** **CONT (F1)** to access **SURVEY Survey Begin**.	
3.	**CONT (F1)** to access **SURVEY Survey: Job Name**. Turn the telescope until **<Hz: 0.0000 g>**.	
4.	Look through the telescope with **<Hz: 0.0000 g>** to select an object which is easily recognisable.	

Step	Description	Refer to chapter
5.	Standing at the instrument point the compass to the selected object and turn the rotating dial until the "N" lines up with the north end of the compass needle. ☞ The compass dial must not be turned once the "N" is lined up with the north end of the compass needle.	
6.	Go to the reflector.	
7.	**SHIFT USER** to access **QUICK SET Change Settings to:**.	
8.	**QUICK SET Change Settings to:** **COMPS (F1)** to access **QUICK SET Orientation With Compass**.	3.3.1
9.	**QUICK SET Orientation With Compass** From the reflector aim the "N" of the compass towards the instrument. Read the horizontal angle as pointed to by the north end of the compass needle. **<Hz-Compass:>** The horizontal angle read from the compass while aiming to the instrument. **<V-Compass:>** If the compass works as a clinometer, those values can also be used. ☞ The horizontal and vertical angle reads from the compass are always displayed in degree regardless of the system settings.	
10.	**CONT (F1)** to access **SURVEY Survey: Job Name**. The instrument turns to the reflector.	

Step	Description	Refer to chapter
	For **<Automation: iLock>** an iLock measurement is performed. If no prism was found, the instrument turns to the position typed in for **<Hz-Compass:>** and **<V-Compass:>**. For **<Automation: Robotic>** the instrument locks on the prism and the Robotic icon is displayed. If no prism was found, the instrument turns to the position typed in for **<Hz-Compass:>** and **<V-Compass:>**.	

3.3.2 Positioning Hz/V

Description

The **QUICK SET Positioning Hz/V** screen is used when the instrument is remote controlled and the telescope should be turned to a certain direction.
On the **Absolute** page, angular values for **<Hz-Angle:>** and **<V-Angle:>** related to the set orientation can be typed in.
On the **Relative** page, angular difference values for **<ΔHz:>** and **<ΔV:>** relative to the current telescope position can be typed in.These values are added to the current telescope position to calculate the new direction for the telescope to turn to.

Access

Press **Hz/V (F2)** in the **QUICK SET Change Settings to:** screen. Refer to "3.2 QUICK SET Change Settings to:".

Hz/V positioning step-by-step

Step	Description
1.	**QUICK SET Change Settings to:**
2.	**Hz/V (F2)** to access **QUICK SET Positioning Hz/V, Absolute** page.
3.	• To position with absolute Hz/V angles continue with step 4. • To position with relative Hz/V angles continue with step 6.
4.	**QUICK SET Positioning Hz/V, Absolute** page **<Hz-Angle:>** Oriented horizontal direction for the instrument to turn to. **<V-Angle:>** Vertical direction for the instrument to turn to>.
5.	Continue with step 8.
6.	**PAGE (F6)** to access **QUICK SET Positioning Hz/V, Relative** page.
7.	**QUICK SET Positioning Hz/V, Relative** page

Step	Description
	<ΔHz:> Angular difference for the horizontal angle to turn to. **<ΔV:>** Angular difference for the vertical angle to turn to.
8.	**CONT (F1)**. The instrument turns to the reflector. For **<Automation: iLock>** an iLock measurement is performed. If no prism was found, the instrument turns to the position typed in for **<Hz-Angle:>** and **<V-Angle:>** or **<ΔHz:>** and **<ΔV:>**. For **<Automation: Robotic>** the instrument locks on the prism and the Robotic icon is displayed. If no prism was found, the instrument turns to the position typed in for **<Hz-Angle:>** and **<V-Angle:>** or **<ΔHz:>** and **<ΔV:>**.

3.3.3 Move by Joystick

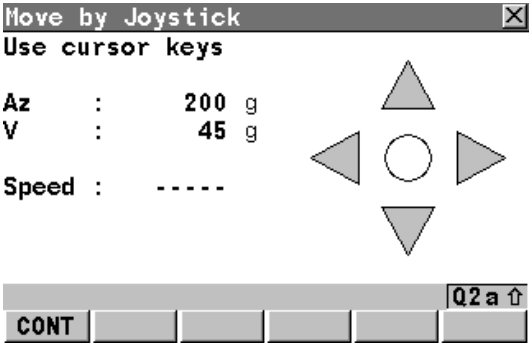
Description

In **QUICK SET Move by Joystick** the instrument can be turned using the arrow keys on the keyboard of the instrument or the arrow keys displayed on the touch screen.
When **QUICK SET Move by Joystick** is accessed, the SureBeam is turned on automatically. When leaving the screen, the SureBeam is turned off.

Access

Press **JSTCK (F3)** on the **QUICK SET Change Settings to:** screen. Refer to "3.2 QUICK SET Change Settings to:".

QUICK SET Move by Joystick



CONT (F1)
To exit **QUICK SET Move by Joystick**.

Description of fields

Field	Option	Description
Speed	Output	Displays the rotating speed of the instrument. Press the same arrow key to change the speed from ----- to slow to medium to fast.

Next step
CONT (F1) to exit the **QUICK SET Move by Joystick** screen.

Move by joystick step-by-step

Step	Description
1.	**QUICK SET Change Settings to:**
2.	**JSTCK (F3)** to access **QUICK SET Move by Joystick**.
3.	**QUICK SET Move by Joystick** Use the arrow keys to start the telescope movement. Press an arrow key again to speed up the movement. Press any of the other arrow keys while the instrument turns to stop the movement.
☞	The behaviour of the touch screen when working with a controller is similar. Additional to the arrow keys a stop key is displayed as a round key in the middle of the arrow keys. Press the stop key to stop the instrument movement.

3.3.4 Check Recorded Point / Backsight Point

Description

- The **QUICK SET Check Recorded Pt/Backsight Pt** screen is to check if a measured point is identical to a point already stored in the job or if the instruments orientation to a backsight point is still correct.

Access

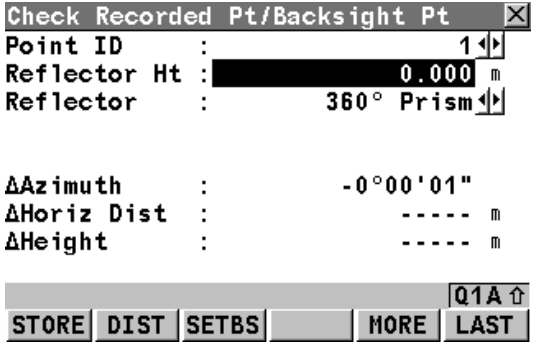
Press **SHIFT USER** and **CHKPT (F4)**.

OR

Press **USER**.

Refer to "2 USER Key" for information on the **USER** key.

QUICK SET Check Recorded Pt/Backsight Pt



STORE (F1)
To exit **QUICK SET Check Recorded Pt/Backsight Pt**.

DIST (F2)
To measure a distance.

SETBS (F3)
To set the station and orientation of the instrument by taking a single measurement to a known backsight point. Refer to "33.4.3 Known Backsight Point".

MORE (F5)
To display additional information.

LAST (F6)
To recall **<Point ID:>** of the last checked point.

SHIFT POSIT (F4)
To position to the selected point.
For **<Automation: iLock>,** the instrument does an iLock search.
For **<Automation: Robotic>** the instrument tries to lock on to a reflector.

Next step
Refer to paragraph "Check point step-by-step" for information on how to check a recorded point.

Check point step-by-step

Step	Description
1.	**QUICK SET Change Settings to:**
2.	**CHKPT (F4)** to access **QUICK SET Check Recorded Pt/Backsight Pt**.
3.	**QUICK SET Check Recorded Pt/Backsight Pt** **<Point ID:>** Point ID to be checked. **<Calculated Az:>** Calculated azimuth between station and backsight point. **<Current Az:>** Current orientation. **<ΔAz:>** Difference between calculated azimuth and current orientation.
4.	**POSIT (F5)** to position to the point.
5.	**DIST (F2)** to measure a distance.
☞	**SETBS (F3)** to set the station and orientation of the instrument by taking a single measurement to a known backsight point.

Step	Description
6.	**CONT (F1)** to return to the screen **QUICK SET Change Settings to:** was accessed from.

If a stored point was checked, the **<Point ID:>** for that point is remembered and recalled when **LAST (F6)** is pressed.

3.3.5 Robotic

R.GO (F5)

When **R.GO (F5)** is pressed, an iLock search is performed, the instrument locks onto the reflector without a measurement. **<Automation: Robotic>** is set.

R.GO (F5) can be used to lock onto a prism located on an unstable surface for example on a boat or near to the instrument.

R.INT (F5)

When the instrument is locked onto the prism this lock can be interrupted with pressing **R.INT (F5)**.

R.INT (F5) can be used to interrupt the instrument from being locked onto the reflector, for example, to mark a ground point.

Distances to side shot points cannot be measured while the lock mode is interrupted with **<Automation: Robotic>**.

3.4 Working examples

3.4.1 Working Example 1 - iLock

Description

Application:	Measure points with iLock.
Working technique:	Application program Survey.
Goal:	Find prism with iLock.

Requirement

<Automation: iLock>.

Prism search with iLock step-by-step

Step	Description
1.	Press **ALL (F1)** in **SURVEY Survey: Job Name**. ☞ Press **DIST (F2)** to measure a distance.
2.	The instrument searches for the prism with iLock search in the iLock window.
3.	If a prism was found • Distance and angles are measured and stored. • The instrument points in the direction of the prism and does not follow the prism when it is moving.
4.	If no prism was found • The instrument turns to the starting position of the iLock search.

3.4.2 Working Example 2 - Robotic

Description

Application:	Measure points with Robotic.
Working technique:	Application program Survey.
Goal:	Find prism with Robotic activated.

Requirement

<Automation: Robotic>.

Prism search with Robotic step-by-step

Step	Description
1.	Press **ALL (F1)** in **SURVEY Survey: Job Name**. ☞ Press **DIST (F2)** to measure a distance. ☞ Press **R.GO (F5)** to lock onto the reflector without measurement.
2.	The instrument searches for the prism with iLock search in the Aim window.
3.	If a prism was found • Distance and angles are measured and stored. • The instrument locks on to the prism and follows its movements. The Robotic icon is displayed.
4.	If no prism was found • The instrument turns to the starting position of the iLock search.

3.4.3 Working Example 3 - Loss of Robotic

Description

Application:	Points were measured with Robotic until loss of lock.
Working technique:	Application program Survey.
Goal:	Prism search after loss of lock.

Requirements

- **<Automation: Robotic>**
- The instrument is locked onto the prism.
- The instrument is remotely controlled.
- **<Predict for: 3 s>**

Prism search after loss of Robotic step-by-step

Step	Description
1.	Move the prism behind an object to make the instrument lose lock.
2.	The prism path is predicted for three seconds. The instrument turns with the calculated velocity and direction of the lost prism during this time.
3.	If a prism was found during prediction, • the instrument locks on to the prism and follows its movements. The Robotic icon is displayed.
4.	If no prism was found during prediction, a search is started depending on the setting of **<Search with:>** in **CONFIGURE Automatic Prism Search** • For **<Search with: No Search>**: No search is started. • For **<Search with: iLock>**: An iLock search is started in a dynamic Aim window which is calculated depending on the velocity of the prism. • For **<Search with: Last Point>** and **<Automation: Robotic>**: The instrument turns back to the last stored point.
5.	If prism was not found with **<Search with:>**, • The instrument telescope stays at the end position of prediction. • The SureBeam is activated.
☞	Refer to "3.4.2 Working Example 2 - Robotic" for information on how to enable lock.

4 User Interface

4.1 Keyboard

Keys

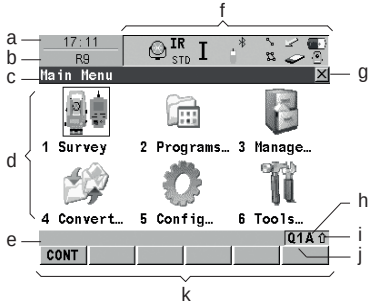
Key	Description
Alphanumeric keys	• To type letters and numbers.
CE	• Clears all entry at the beginning of user input. • Clears the last character during user input.
ESC	• Leaves the current menu or dialog without storing changes made.
USER	• Calls the user defined menu.
ON	• If the instrument is off: to turn the instrument on. • If the instrument is on: to access the **Programs** menu.
ENTER	• Selects the highlighted line and leads to the next logical dialog/menu. • Starts the edit mode for edit fields. • Opens a list box.
SHIFT	• Changes between the first and the second level of function keys.
Arrow keys	• Move the focus on the screen.
Function keys **F1-F6**	• Correspond to the six softkeys that appear on the bottom of the screen when the screen is activated.

Key combinations

Keys	Description
ON plus **USER**	Turns the instrument off, when in **R9 Main Menu**.
SHIFT USER	Calls **QUICK SET Change Settings to**.
SHIFT ▲	Pages up.
SHIFT ▼	Pages down.

4.2 Screen

Screen



a) Time
b) Caption
c) Title
d) Screen area
e) Message line
f) Icons
g) ESC ⊠
h) CAPS
i) SHIFT icon
j) Quick coding icon
k) Softkeys

Elements of the screen

Element	Description
Time	The current local time is shown.
Caption	Shows location either in **Main Menu**, under **ON** key or **USER** key.
Title	Name of the screen is shown.
Screen area	The working area of the screen.
Message line	Messages are shown for 10 s.
Icons	Shows the current status information of the instrument. Refer to "4.4 Icons". Can be used with touch screen.
ESC ⊠	Can be used with touch screen. Same functionality as the fixed key **ESC**. The last operation will be undone.

Element	Description
CAPS	The caps mode for upper case letters is active.The caps mode is activated and deactivated by pressing **UPPER (F5)** or **LOWER (F5)** in some screens.
SHIFT icon	Shows the status of the **SHIFT** key; either first or second level of softkeys is selected. Can be used with touch screen and has the same functionality as the fixed key **SHIFT**.
Quick coding icon	Shows the quick coding configuration. Can be used with touch screen to turn quick coding on and off.
Softkeys	Commands can be executed using **F1**-**F6** keys. The commands assigned to the softkeys are screen dependent. Can be used directly with touch screen.
Scroll bar	Scrolls the screen area up and down.

4.3 Operating Principles

Keyboard and touch screen

The user interface is operated either by the keyboard or by the touch screen with supplied stylus. The workflow is the same for keyboard and touch screen entry, the only difference lies in the way information is selected and entered.

Operation by keyboard

Information is selected and entered using the keys. Refer to "4.1 Keyboard" for further details of the keys on the keyboard and their function.

Operation by touch screen

Information is selected and entered on the screen using the supplied stylus.

Operation	Description
To select an item	Tap on the item.
To start the edit mode in input fields	Tap on the input field.
To highlight an item or parts of it for editing	Drag the supplied stylus from the left to the right.
To accept data entered into an input field and exit the edit mode	Tap somewhere else on the screen outside of the input field.

Turn instrument on

Press and hold **ON** for 2 s.

Turn instrument off step-by-step

Step	Description
	The instrument can only be turned off in **R9 Main Menu**.
1.	Press and hold both **USER** and **ON** simultaneously.
2.	Press **YES (F6)** to continue or **NO (F4)** to cancel.

Lock/Unlock keyboard

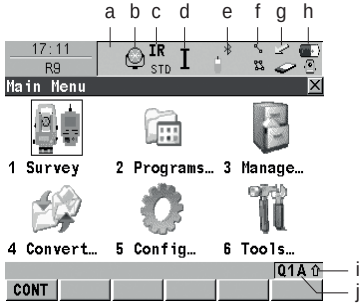
Option	Description
Lock	To lock the keyboard press and hold **SHIFT** for 3 s. The message 'Keyboard locked' is momentarily displayed on the Message Line.
Unlock	To unlock the keyboard press and hold **SHIFT** for 3 s. The message 'Keyboard unlocked' is momentarily displayed on the Message Line.

4.4 Icons

Description

The screen icons display the current status information of the instrument.

Allocation of icons



a) iLock/Robotic
b) Reflector
c) EDM
d) Compensator/face I&II
e) Bluetooth
f) Line/area
g) CompactFlash card
h) Battery
i) **SHIFT**
j) Quick coding

iLock/Robotic

Tapping the icon leads to **QUICK SET Change Settings to**.

Icon	Description
	iLock active.
	Low Visibility mode is active.
	Short Range mode is active.
	Robotic active.

Icon	Description
	Robotic active. Prism being followed.
	Robotic active. Prism lost. Instrument locks onto reflector if in field of view.
	iLock Searching.
	Prediction.

Reflector

Tapping the icon leads to **MANAGE Reflectors**.

Icon	Description
	360° Prism.
	Reflectorless.
	User defined prism.

EDM

Tapping the icon leads to **CONFIGURE EDM & iLock Settings**.

Icon	Description
	EDM type: Reflector IR, possible modes are: STD - Standard, FAST - Fast, TRK - Tracking, AVG - Averaging, SYNC - SynchroTrack
	Red laser is turned on.
	EDM type: Reflectorless RL, possible modes are: STD - Standard, TRK - Tracking, AVG - Averaging
	EDM type: Long Range LO, possible modes are: STD - Standard, AVG - Averaging
	Auto points are being recorded by time.
	Auto points are being recorded by distance or height.
	Auto points are being recorded by stop & go.

Compensator/ face I&II

Tapping the icon leads to **CONFIGURE Compensator**.

Icon	Description
	Compensator is turned off.
	Compensator is turned on, but is out of range.
	The current face of the instrument is shown, if the compensator and the Hz-correction are turned on.

Bluetooth

Tapping the icon leads to **STATUS Bluetooth**.

Icon	Description
	The Instrument is Bluetooth capable.
	The Bluetooth connection on Port 3 is established and is ready to be used.
	The Bluetooth connection on Port 3 is established, active and is communicating data.

Line/area

Tapping the icon leads to **MANAGE Data: Job Name**.

Icon	Description
	The number of lines and areas which are currently open in the active job is shown.

CompactFlash card

- The capacity of used space is shown in seven levels.
- Tapping the icon leads to **STATUS Battery & Memory**.

Icon	Description
	The CompactFlash card is inserted and can be removed.
	The CompactFlash card is inserted and cannot be removed. It is strongly recommended not to remove the CompactFlash card to avoid loss of data.
No icon	No CompactFlash card is inserted.

Battery

- The status and source of the battery is displayed. If an external battery is connected and an internal battery is inserted, then the internal battery is used.
- Tapping the icon leads to **STATUS Battery & Memory**.

Icon	Description
	An internal battery is inserted and in use.
	An external battery is connected and in use.

SHIFT

- Tapping the icon shows additional softkeys.

Icon	Description
	Additional softkeys are available in the currently visible screen.
	The **SHIFT** key has been pressed.

Quick coding

- The quick coding is displayed. Visible during Survey and other application programs where it is possible to measure a point with quick codes.
- Tapping the icon turns the quick coding on or off.

Icon	Description
Q1	Quick coding is turned on. Quick codes with one/two/three digit are used from the active codelist.
Q1	Quick coding for quick codes with one/two/thre digit is turned off.

4.5 Symbols

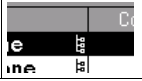
Description

The symbols provide information regarding settings.

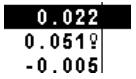
Filter

Symbol	Description	Example
⧩	The filter symbol is shown on the **Points**, **Lines**, **Area** or **Map** page if a point, line or area filter is active.	

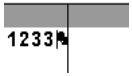
Attributes

Symbol	Description	Example
⌗	The attribute symbol is displayed in **MANAGE Codes** to indicate codes that have attributes attached.	

Limits

Symbol	Description	Example
?	Indicates a defined limit has been exceeded.	

Staked out

Symbol	Description	Example
⚑	This symbol is used in **MANAGE Data: Job Name** to indicate points which have been staked out. The staked out flag can be reset in **MANAGE Stakeout Filter**.	

5 Main Menu

5.1 Main Menu Functions

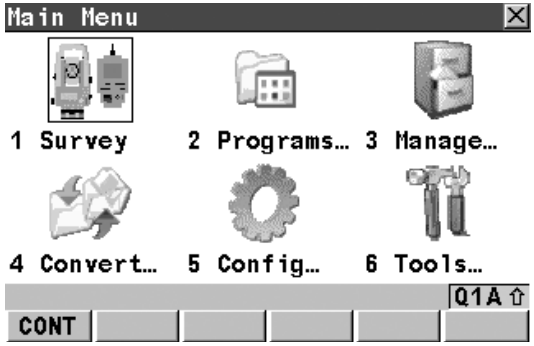
Description

The main menu is normally the first screen displayed when the instrument is switched on.
If the PIN protection is active, **R9 Enter Security PIN Code** is displayed first. After typing in the correct PIN code, the main menu is displayed.

☞

If desired, the instrument can be configured to start up with a user defined screen. Refer to "17.6 Start Up & Power Down".

Main Menu



CONT (F1)
To select the highlighted option and to continue with the subsequent screen.

Description of the main menu functions

Main menu function	Description	Refer to chapter
Survey	• To start measuring.	5.2
Programs...	• To select and start application programs.	5.3

Main menu function	Description	Refer to chapter
Manage...	• To manage jobs, data, codelists, configurations sets and reflectors.	5.4
Convert...	• To export data from a job on the instrument to a file on the CompactFlash card in a customised ASCII format or in DXF format. • To import ASCII, GSI or DXF data from a file on the CompactFlash card to a job on the instrument.	5.5
Config...	• To access all configuration parameters related to a survey, the instrument and the interfaces.	5.6
Tools...	• To format the memory device. • To upload files relevant for the instrument functionality, for example, firmware and language files. • To transfer non data related files between instrument and CompactFlash card. • To perform arithmetic operations such as addition, subtraction, multiplication, division, statistical functions, trigonometric functions, conversions or roots. • To view files on the CompactFlash card. • To type in or load a licence key. • To calibrate the instrument.	5.7

5.2 Survey

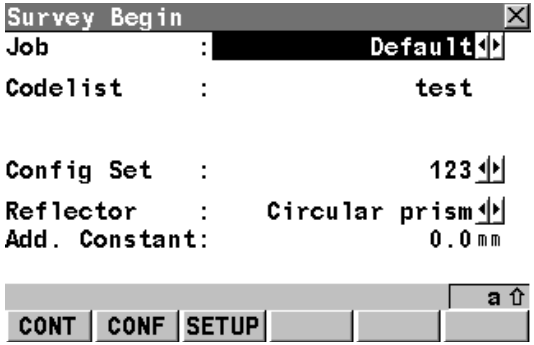
Access

Select **Main Menu: Survey**.

Description

Survey provides the functionality used to perform the survey.

SURVEY
Survey Begin



CONT (F1)
To accept settings and to continue with screen **SURVEY Survey: Job Name**.

CONF (F2)
To configure auto point and remote point measurements functionality.

SETUP (F3)
To set up station. Accesses **SETUP Station Setup**.

Next step

For **Main Menu: Survey** Refer to chapter 35

5.3 Programs...

Access

Select **Main Menu: Programs...**.

OR

Press **ON**.

Description

Programs... accesses the application programs menu. The screen of the application programs menu is called **R9 Programs**.

R9 Programs

The application programs menu contains all loaded application programs including Survey and Setup. They are listed in the order in which they were loaded.

CONT (F1)
To select the highlighted option and to continue with the subsequent screen.

Next step

For **Main Menu: Programs...\Survey**	Refer to chapter 35
For **Main Menu: Programs...\Setup**	Refer to chapter 33
For **Main Menu: Programs...\COGO**	Refer to chapter 32
For **Main Menu: Programs...\Stakeout**	Refer to chapter 34

5.4 Manage...

Access

Select **Main Menu: Manage...**.

Description

Manage... is used to manage the following:

- jobs.
- data.
- codelists.
- configuration sets.
- reflectors.

Management functions include creating, selecting, editing and deleting.

R9 Management

CONT (F1)
To select the highlighted option and to continue with the subsequent screen.

Next step

For **Main Menu: Manage...\Jobs**	Refer to chapter 6.
For **Main Menu: Manage...\Data**	Refer to chapter 7.
For **Main Menu: Manage...\Codelists**	Refer to chapter 8.
For **Main Menu: Manage...\Configuration Sets**	Refer to chapter 11.
For **Main Menu: Manage...\Reflectors**	Refer to chapter 12.

5.5 Convert...

Access

Select **Main Menu: Convert...**.

Description

Convert... provides access to data exchange options.

R9
Convert Data

CONT (F1)
To select the highlighted option and to continue with the subsequent screen.

Next step

For **Main Menu: Convert...\Export Data from Job**	Refer to chapter 13.
For **Main Menu: Convert...\Import Data to Job**	Refer to chapter 14.

5.6 Config...

Access

Select **Main Menu: Config...**.

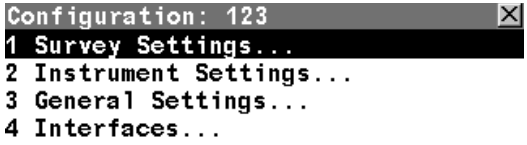
OR

Press **USER** and then **CONF (F2)**.

Description

Config... accesses all configuration parameters related to a survey, the instrument and the interfaces. Any changes made are stored in the configuration set.

R9 Configuration: Configuration Set



CONT (F1)
To select the highlighted option and to continue with the subsequent screen.

Next step

For **Main Menu: Config...\Survey Settings...**	Refer to chapter 15
For **Main Menu: Config...\Instrument Settings...**	Refer to chapter 16
For **Main Menu: Config...\General Settings...**	Refer to chapter 17
For **Main Menu: Config...\Interfaces...**	Refer to chapter 19

5.7 Tools...

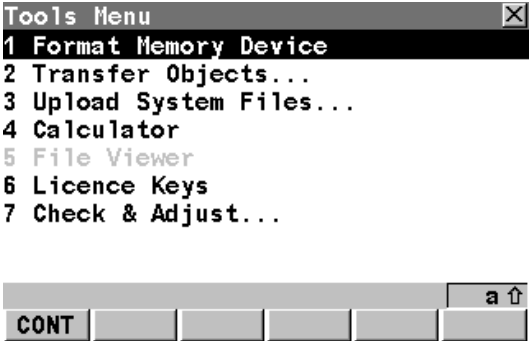
Access

Select **Main Menu: Tools...**.

Description

Tools... provides functionality which is not directly related to surveying data.

Tools Menu



CONT (F1)
To select the highlighted option and to continue with the subsequent screen.

Next step

For **Main Menu: Tools...\Format Memory Device**	Refer to chapter 21
For **Main Menu: Tools...\Transfer Objects...**	Refer to chapter 22
For **Main Menu: Tools...\Upload System Files...**	Refer to chapter 23
For **Main Menu: Tools...\Calculator**	Refer to chapter 24.
For **Main Menu: Tools...\File Viewer**	Refer to chapter 25.
For **Main Menu: Tools...\Licence Keys**	Refer to chapter 26
For **Main Menu: Tools...\Check & Adjust...**	Refer to chapter 27

6 Manage...\Jobs

6.1 Overview

Description

Jobs

- structure surveying projects.
- contain all points, lines, areas and codes that are recorded and stored.
- can be used in Stonex® Tools.
- may be stored on the CompactFlash card.

Type of jobs

- Data jobs. Explained in this chapter.
- Road jobs.

Default job

A job called **Default** is available on the instrument after formatting the memory device, inserting a previously formatted CompactFlash card or deleting all jobs from **MANAGE Jobs (Device)**.

Active job

The active job is the one data is stored to. One job is always considered the active job. After formatting the memory device, the job **Default** is used until a user defined job is created and selected.

When a job becomes active, then the sort and filter settings of this job are saved in the SystemRAM. If the CompactFlash card is formatted then these last used sort and filter settings are used for the job **Default**.

6.2 Accessing Job Management

Access

Select **Main Menu: Manage...\Jobs**.

OR

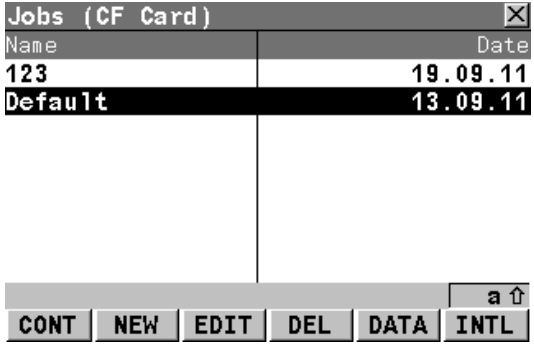
Press **USER**. Refer to "2 USER Key" for information on the **USER** key.

OR

From a choicelist in some screens, for example the **XX Begin** screen of application programs.

MANAGE
Jobs (Device)

Listed are all jobs stored on the CompactFlash card.



CONT (F1)
To select the highlighted job and to return to the screen from where this screen was accessed.

NEW (F2)
To create a job. Refer to "6.3 Creating a New Job".

EDIT (F3)
To edit the highlighted job. Refer to "6.4 Editing a Job".

DEL (F4)
To delete the highlighted job.

DATA (F5)
To view, edit and delete points, lines and areas stored with the job. Points, lines and areas are shown on separate pages. Selected sort and filter settings apply. Refer to "7.3 Point Management".

Next step

IF a job	THEN
is to be selected	highlight the desired job. **CONT (F1)** closes the screen and returns to the screen from where **MANAGE Jobs (Device)** was accessed.
is to be created	**NEW (F2)**. Refer to "6.3 Creating a New Job".
is to be edited	highlight the job and **EDIT (F3)**. Refer to "6.4 Editing a Job".

6.3 Creating a New Job

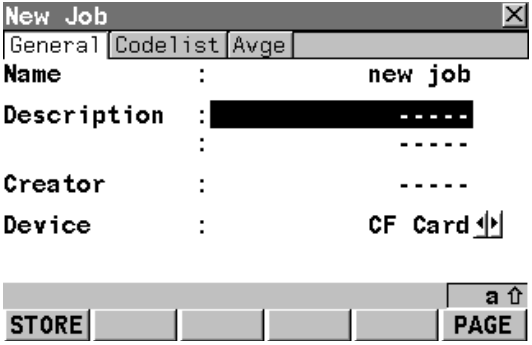
Access

Refer to "6.2 Accessing Job Management" to access **MANAGE Jobs (Device)**.

Create job step-by-step

The following table explains the most common settings. Refer to the stated chapter for more information on screens.

Step	Description	Refer to chapter
1.	In **MANAGE Jobs (Device)** highlight a job. The settings of this job, including sort and filter settings, are applied to the new job.	6.2
2.	**NEW (F2)** to access **MANAGE New Job**.	



STORE (F1)
To store the settings and to return to the screen from where **MANAGE New Job** was accessed.

PAGE (F6)
To change to another page on this screen.

Step	Description	Refer to chapter
3.	**MANAGE New Job, General** page **<Name:>** A unique name for the new job. The name may be up to 16 characters long and may include spaces. Input required. **<Description:>** Two lines for a detailed description of the job. This can be for example, work to be performed or the classes contained in the job. Input optional. **<Creator:>** The person's name who is creating the new job. Input optional. **<Device:>** The device on which the new job will be stored. Depending on the instrument options, this may be an output field.	
4.	**PAGE (F6)** changes to the **Codelist** page.	
5.	**MANAGE New Job, Codelist** page **<Codelist:>** Choosing a codelist copies the codes to the job.	9
6.	**PAGE (F6)** changes to the **Avge** page.	
7.	**MANAGE New Job, Avge** page In order to check measurements, the same point can be measured more than once. If activated, an average or an absolute difference is calculated.	7.3.4

Step	Description	Refer to chapter
	<Averaging Mode:> Defines the averaging principles for multiple measured points. **<Averaging Mode: Average>** computes the average for the position and the height. Points exceeding the defined limits are marked with ❗ in **MANAGE Edit Point**, **Mean** page. **<Averaging Mode: Absolute Diffs>** computes the absolute differences between two points selected from a list of measured points which are all stored with the same point ID. The selection determines the availability of the subsequent fields for setting the acceptable averaging limits or absolute differences. • For **<Averaging Mode: Average>**: **<Method:>** The method used for computing the average. **<Method: Weighted>** calculates a weighted average while **<Method: No Weighting>** is calculating an arithmetic average. **<Points to Use:>** The type of points which will be taken into account for averaging. **<Avge Limit Pos:>** and **<Avge Limit Ht:>** The acceptable difference for the position and height components. • For **<Averaging Mode: Absolute Diffs>**: **<Points to Use:>** The type of points which will be taken into account for absolute differences. From **<Easting:>** to **<Cartesian Z:>** The acceptable absolute differences for each coordinate component. • For **<Averaging Mode: Off>**:	

Step	Description	Refer to chapter
	No other fields are available.	
8.	**STORE (F1)** creates the new job and returns to **MANAGE Jobs (Device)**.	

6.4 Editing a Job

Access

Refer to "6.2 Accessing Job Management" to access **MANAGE Jobs (Device)**.

Edit job step-by-step

The following table explains the most common settings. Refer to the stated chapter for more information on screens.

Step	Description	Refer to chapter
1.	In **MANAGE Jobs (Device)** highlight a job to be edited.	
2.	**EDIT (F3)** to access **MANAGE Edit Job: Job Name, General** page.	
3.	**MANAGE Edit Job: Job Name, General** page **<Name:>** Rename the job. **<Device:>** Cannot be edited. The remaining functionality on this page is identical with the creation of a new job.	6.3
☞	**DATA (F5)** accesses **MANAGE Data: Job Name**. To view, edit and delete points, lines and areas stored with the job. Points, lines and areas are shown on separate pages. Selected sort and filter settings apply.	7.2
☞	**SHIFT LOG (F5)** accesses **MANAGE Data Log: Job Name**. To view, edit and delete points, lines and areas stored with the job. Points, lines and areas are sorted by time in one list.	7.5
4.	**PAGE (F6)** changes to the **Codelist** page.	
5.	Are codes stored in the job? • If **no**, continue with step 6.	

Step	Description	Refer to chapter
	• If **yes**, continue with step 8.	
6.	No codes are stored in the job. **MANAGE Edit Job: Job Name, Codelist** page **<Codelist: <None>>** This default setting can be changed. Choosing a codelist copies the codes to the job. All codelists from **Main Menu: Manage...\Codelists** can be selected.	9
7.	**PAGE (F6)** changes to the **Avge** page. Continue with step 10.	
8.	Codes are stored in the job. **MANAGE Edit Job: Job Name, Codelist** page **<Codelist:>** If codes had been copied from a System RAM codelist, the name of the codelist is displayed. If codes have been typed in, then the name of the active job is displayed.	
☞	**IMPRT (F2)** adds additional codes from a new codelist to the job. The name of this codelist is copied to the job.	8
☞	**SHIFT EXPRT (F2)** copies codes from the job to an existing or new codelist.	8
☞	**CODES (F4)** views codes currently stored in the job.	6.5
9.	**PAGE (F6)** changes to the **Avge** page.	
10.	**MANAGE Edit Job: Job Name, Avge** page The functionality on this page is identical with the creation of a new job.	6.3

Step	Description	Refer to chapter
☞	**DATA (F5)** accesses **MANAGE Data: Job Name**. To view, edit and delete points, lines and areas stored with the job. Points, lines and areas are shown on separate pages. Selected sort and filter settings apply.	7.2
☞	**SHIFT LOG (F5)** accesses **MANAGE Data Log: Job Name**. To view, edit and delete points, lines and areas stored with the job. Points, lines and areas are sorted by time in one list.	7.5
11.	**STORE (F1)** stores the changes and returns to the screen from where **MANAGE Edit Job: Job Name** was accessed.	

6.5 Managing Job Codes

Description

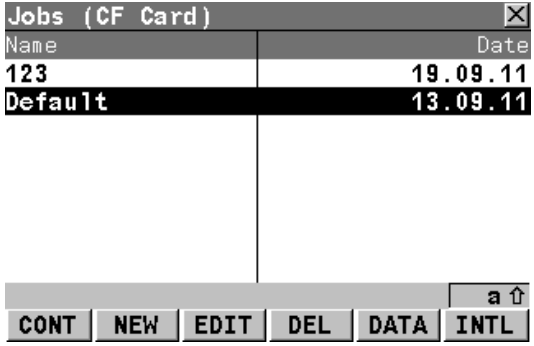
To view, edit, group and sort all codes currently stored in the job. The functionality of this screen is mainly the same as for **MANAGE Codes**. For simplicity, the functionality which is different from **MANAGE Codes** is explained here. Refer to "8.5 Managing Codes" for information on **MANAGE Codes**.

Access step-by-step

Available for jobs which have a codelist attached.

Step	Description
1.	Refer to "6.2 Accessing Job Management" to access **MANAGE Jobs (Device)**.
2.	In **MANAGE Jobs (Device)** highlight a job to be edited.
3.	**EDIT (F3)** to access **MANAGE Edit Job: Job Name**.
4.	In **MANAGE Edit Job: Job Name**, **PAGE (F6)** until the **Codelist** page is active.
5.	**CODES (F4)** to access **MANAGE Job Codes**.

MANAGE
Job Codes



CONT (F1)
To return to **MANAGE Edit Job: Job Name**, **Codelist** page.

NEW (F2)
To create a new code. Refer to "8.5.2 Creating a New Code".

EDIT (F3)
To edit the highlighted code. Accesses **MANAGE Edit Code** where new attributes can be added to a code and line styles can be changed. Refer to paragraph "MANAGE Edit Code".

DEL (F4)
To delete an existing code.

MORE (F5)
To display information about the code group, the code type, the code description and the quick codes if available.

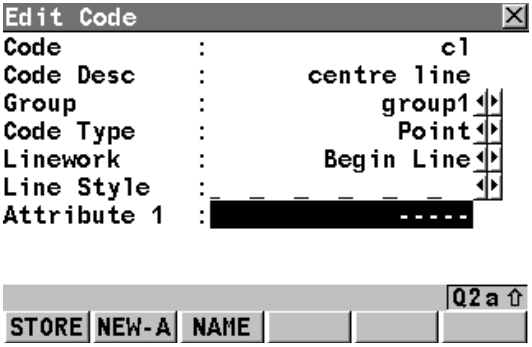
SHIFT GROUP (F4)
To access **MANAGE Code Groups**. To view, create, activate and deactivate code groups. Refer to "8.6 Managing Code Groups".

SHIFT SORT (F5)
To access **MANAGE Sort Codes**. To sort codes by code name, code description, quick code or last used.

Next step

IF	THEN
the job codes do not need to be changed	**CONT (F1)** closes the screen and returns to the screen from where **MANAGE Job Codes** was accessed.
a new job code is to be created	**NEW (F2)**. Refer to "8.5.2 Creating a New Code".
an existing job code is to be edited	highlight the job code and **EDIT (F3)**. Refer to paragraph "MANAGE Edit Code".

MANAGE Edit Code



STORE (F1)
To store the code including any newly created attributes and to return to the screen from where **MANAGE Edit Code** was accessed.

NEW-A (F2)
To add a new attribute to a code.

NAME (F3) or **VALUE (F3)**
Available for attributes for which an attribute name can be typed in. To highlight **<Attribute n:>** or the field for the attribute value. The name of **<Attribute n:>** can be edited and an attribute value can be typed in.

The behaviour of this screen varies with the type of code to be edited. The differences are explained in the table.

Type of code	Description
Point codes and **Free codes**	• New attributes can be added with **NEW-A (F2)**.
Line codes and **Area codes**	• New attributes can be added with **NEW-A (F2)**. • The line style can be changed. This new line style is stored to the code. It can be decided whether or not to update the line style of all previously stored lines/areas with this code in this job.

7 Manage...\Data

7.1 Overview

Description

- Data is a generic term for points, lines and areas.
- Data management is the administration of data stored in the active job. This includes
  - viewing data with their related information.
  - editing data.
  - creating new data.
  - deleting existing data.
  - filtering existing data.

Objects

- Objects
  - are points, lines and areas.
  - have a unique identification ID. This is the point ID, the line ID and the area ID.
  - may or may not have a code attached. This is either a point code, a line code or an area code depending on the type of object. Refer to "9 Coding" for information on coding.

7.2 Accessing Data Management

Access

Select **Main Menu: Manage...\Data**.

OR

Press **USER**. Refer to "2 USER Key" for information on the **USER** key.

OR

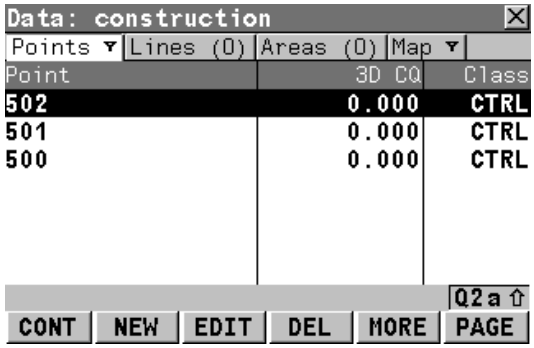
From a choicelist in some screens for example in application programs.

OR

Tap the line/area icon.

The objects listed on the pages belong to the currently active job. The objects listed and their order depend on the active sort and filter settings. An active filter for a page is indicated by ⧩ to the right of the name of the page. Refer to "7.6 Point Sorting and Filters" for information about sort and filter settings.

MANAGE
Data: Job Name, Points page



CONT (F1)
To close the screen and return to the screen from where this screen was accessed.

NEW (F2)
To create a point.

EDIT (F3)
To edit the highlighted point.

DEL (F4)
To delete the highlighted point.

MORE (F5)
To display information about the codes if stored with any point, the time and the date of when the point was stored, the 3D coordinate quality, the class and the flag for Linework.

PAGE (F6)
To change to another page on this screen.

SHIFT LOG (F4)
To view points, lines, areas and free codes stored with the job sorted by time. Refer to "7.5 Data Log".

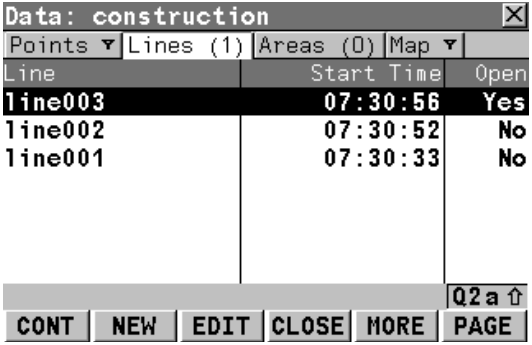
SHIFT FILT (F5)
To define sort and filter settings. Refer to "7.6 Point Sorting and Filters".

Next step

IF	THEN
a point is to be created	highlight the point and **NEW (F2)**. Refer to "7.3.2 Creating a New Point".
a point is to be edited	highlight the point and **EDIT (F3)**. Refer to "7.3.3 Editing a Point".
a line/area is to be managed	**PAGE (F6)** changes to the **Lines (X)** and **Areas (X)** page. Refer to paragraph "MANAGE Data: Job Name, Lines (X) page; MANAGE Data: Job Name, Areas (X) page".

MANAGE Data: Job Name, Lines (X) page; MANAGE Data: Job Name, Areas (X) page

The explanations for the softkeys given below are valid for both pages.
The number in brackets next to the name of the page indicate the number of open lines/areas. Example: **Lines (2)/Areas (2)** means that two lines/areas are open.



CONT (F1)
To close the screen and return to the screen from where this screen was accessed.

NEW (F2)
To create a line/area. After storing the new line, all existing lines and areas which are open are closed.

EDIT (F3)
To edit the highlighted line/area.

CLOSE (F4) and **OPEN (F4)**
To change between the options in the **Open** column of the highlighted line/area.

MORE (F5)
To display information about the codes if stored with any line/area, the start time, the end time of when the last point was added to the line/area, the length of the line, the perimeter and the area of the area.

PAGE (F6)
To change to another page on this screen.

SHIFT DEL (F4)
To delete the highlighted line/area.

SHIFT FILT (F5)
To define sort and filter settings. Refer to "7.6 Point Sorting and Filters".

Description of columns

Column	Description
Line or **Area**	The listed lines/areas already stored in the active job.
Open	The status of a line/area. • **Yes** The line/area is open. Measured points are assigned to the line/area. • **No** The line/area is closed. Measured points are not assigned to the line/area. **CLOSE (F4)** and **OPEN (F4)** change between the options.

Next step

IF the line/area	THEN
management is completed	**CONT (F1)** closes the screen and returns to the screen from where this screen was accessed.
is to be opened	highlight the line/area and **OPEN (F4)**.
is to be closed	highlight the line/area and **CLOSE (F4)**
is to be created	**NEW (F2)**. Refer to "7.4.2 Creating a New Line/Area".
is to be edited	highlight the line/area and **EDIT (F3)** to access **MANAGE Edit Line: Line ID** or **MANAGE Edit Area: Area ID**. Refer to "7.4.3 Editing a Line/Area".
is to be viewed	**PAGE (F6)** until the **Map** page is active. Refer to "30.5 Map Mode" for information about the functionality and softkeys available on the **Map** page.

7.3 Point Management

7.3.1 Terminology

Description

- This chapter describes technical terms related to data management.

Coordinate triplet

- A measured point consists of three coordinate components - two horizontal components and one vertical component. The generic term for the three coordinate components is coordinate triplet.
- Depending on the class, a point ID can contain more than one coordinate triplet of the same and/or of different classes.

Class

The class describes the type of coordinate triplet.

Description of classes

The following table shows the classes in descending hierarchical order.

Class	Characteristic	Description
CTRL	Type	Control points. Automatically assigned to entered points.
	Instrument source	**TPS** or **Stonex® Tools**
	Number of triplets	One.
REF	Type	Station point set by Setup application program.
	Instrument source	**TPS** or **Stonex® Tools**
	Number of triplets	One.

Class	Characteristic	Description
AVGE	Type	Averaged point calculated when more than one coordinate triplet of class **MEAS** exist for the same point ID unless **<Averaging Mode: Off>**.
	Instrument source	**TPS**
	Number of triplets	One.
MEAS	Type	• Measured points with angles and distances. • Calculated from some application programs.
	Instrument source	**TPS** or **Stonex® Tools**
	Number of triplets	Multiple. With more than one measured coordinate triplet, the average for the position and the height can be computed.
NONE	Type	Measured points with angles.
	Instrument source	**TPS**.
	Possible number of triplets	Unlimited.

Sub class

The sub class describes certain classes in detail. It indicates the status of the position when a coordinate triplet was measured and how the coordinates were determined.

Sub class	Description
COGO	Indirect coordinate determination with application program COGO.
NONE	Direction is available but no coordinates. Height is available but no position coordinates.
TPS	Measured with distances and angles.
Fixed (Height)	Manually entered and fixed in height.
Fixed (Position)	Manually entered and fixed in position.
Fixed (Pos & Ht)	Manually entered and fixed in position and height.

Source

The source describes the application program or functionality that generated a coordinate triplet and the method with which it was created.

Source	Originated from application program/functionality
ASCII File	Convert Data, Import ASCII/GSI Data to Job
Arc Base Pt	COGO, Arc Calculation - Base Point
Arc Centre Pt	COGO, Arc Calculation - Centre Point
Arc Offset Pt	COGO, Arc Calculation - Offset Point
Arc Segmt Pt	COGO, Arc Calculation - Segmentation
COGO Area Divsn.	COGO Area Division
COGO Shift/Rtn	COGO, Shift, Rotate & Scale (Manual) COGO, Shift, Rotate & Scale (Match Pts)
COGO Traverse	COGO, Traverse
GSI File	Convert Data, Import ASCII/GSI Data to Job
Intsct (Brg Brg)	COGO, Intersection - Bearing - Bearing
Intsct (Brg Dst)	COGO, Intersection - Bearing - Distance
Intsct (Dst Dst)	COGO, Intersection - Distance - Distance
Intsct (4 Pts)	COGO, Intersection - By points
Line Base Pt	COGO, Line Calculation - Base Point
Line Offset Pt	COGO, Line Calculation - Offset Point
Line Segmt Pt	COGO, Line Calculation - Segmentation
None	No information on the source is available

Source	Originated from application program/functionality
Setup (Known BS)	Setup, Known Backsight Point
Setup (Loc Rsct)	Setup, Local Resection
Setup (Ori&Ht)	Setup, Orientation and Height Transfer
Setup (Resect)	Setup, Resection
Setup (Resect H)	Setup, Resection Helmert
Setup (Set Az)	Setup, Set Azimuth
Srvy Auto Offset	Survey Auto Points, automatically recorded with offsets
Stakeout	Stakeout
Survey	Survey, measured
Survey (Auto)	Survey Auto Points, automatically recorded
Survey (Rem Pt)	Survey, Remote Point
Unknown	-
User Entered	Manually entered point

Instrument source

The instrument source describes where the coordinate triplet was measured or entered. The options are **TPS**, **Stonex® Tools** or **Level**.

Coordinate quality

Description

The **C**oordinate **Q**uality is an indicator for the estimated quality of the point coordinates. The coordinate quality of the measurements is used in point averaging.

Column	Description
Est 3D CQ	Estimated 3D coordinate quality of computed position.
Est 2D CQ	Estimated plan coordinate quality of computed position.
Est 1D CQ	Estimated height coordinate quality of computed position.

Vertical angles are always assuming Zenith angles and not elevation angles. Standard deviations of circle readings relate to one face measurements.

$$\rho = \frac{200}{\pi}$$

Standard deviation of circle reading

$$\sigma_{Hz,V}[rad] = \frac{\sigma_{Hz,V}[gon]}{\rho}$$

$\sigma_{Hz,V}$ Standard deviation of circle reading if $\sigma_{Hz} = \sigma_V$.
σ_{Hz}: Standard deviation of horizontal circle reading.
σ_V: Standard deviation of vertical circle reading.

Standard deviation of distance measurement

$$\sigma_D = c_D + ppm * D$$

σ_D	Standard deviation of distance measurement.
c_D	Constant part of EDM accuracy.
ppm	ppm part of EDM accuracy.
D	Slope Distance.

1D estimated coordinate quality

$$1D\ CQ = \sqrt{\sigma^2_D * \cos^2 V + \sigma^2_{Hz,\,V} * D^2 * \sin^2 V}$$

1D CQ	Estimated coordinate quality of the height.
V	Zenith angle.

2D estimated coordinate quality

$$2D\ CQ = \sqrt{\sigma^2_D * \sin^2 V + \sigma^2_{Hz,\,V} * D^2}$$

2D CQ	Estimated horizontal coordinate quality.

3D estimated coordinate quality

$$3D\ CQ = \sqrt{\sigma^2_D + \sigma^2_{Hz,\,V} * D^2 * (1 + \sin^2 V)}$$

3D CQ	Estimated spatial coordinate quality.

Working Example 1

Instrument:	R9 2"
Angular accuracy:	2" = $6.1728*10^{-4}$ gon => σHz,V = 2"*√2
EDM accuracy:	2 mm + 2 ppm for an IR measurement
Slope distance:	150 m
Hz:	210 gon
V:	83 gon

1D CQ = 0.00207 m ≙ 2.1 mm
2D CQ = 0.00303 m ≙ 3.0 mm
3D CQ = 0.00367 m ≙ 3.7 mm

Working Example 2

Instrument:	R9 2"
Angular accuracy:	2" = $6.1728*10^{-4}$ gon => σHz,V = 2"*√2
EDM accuracy:	2 mm + 2 ppm for an IR measurement
Slope distance:	7000 m
Hz:	210 gon
V:	83 gon

1D CQ = 0.0927 m
2D CQ = 0.0972 m
3D CQ = 0.1343 m

7.3.2 Creating a New Point

Access

Refer to "7.2 Accessing Data Management" to access **MANAGE Data: Job Name**.

Create point step-by-step

The following table explains the most common settings. Refer to the stated chapter for more information on screens.

Step	Description	Refer to chapter
1.	**MANAGE Data: Job Name**, **Points** page	
2.	**NEW (F2)** to access **MANAGE New Point**.	
3.	**MANAGE New Point**, **Coords** page **<Point ID:>** The name of the new point. The configured point ID template is used. The ID can be changed. • To start a new sequence of point ID's overtype the point ID. • For an individual name independent of the ID template **SHIFT INDIV (F5)**. **SHIFT RUN (F5)** changes back to the next ID from the configured ID template. Enter a point ID and the coordinates.	
4.	**PAGE (F6)** changes to the **Code** page.	
5.	**MANAGE New Point**, **Code** page The setting for **<Thematc Codes:>** in **CONFIGURE Coding Settings** determines the availability of the subsequent fields and softkeys.	15.3

Step	Description	Refer to chapter
	• For **<Thematc Codes: With Codelist>**: The codes from the job codelist are used. **<Point Code:>** All point codes of the job codelist can be selected. The description of the code is shown as an output field. The attributes are shown as output, input or choicelist fields depending on their definition. • For **<Thematc Codes: Without Codelist>**: Codes for points can be typed in but not selected from a codelist. **<Point Code:>** The code to be stored with the point. A check is performed to see if a point code of this name already exists in the job. If so, the according attributes are shown. **<Attribute n:>** Up to eight attribute values are available.	
6.	Is **<Thematc Codes: With Codelist>**? • If **yes**, continue with the next row. • If **no**, continue with step 7.	
	NEW-A (F2) allows additional attributes to be created for this point code.	
	NAME (F3) or **VALUE (F3)** Available for attributes for which an attribute name can be typed in. To highlight **<Attribute n:>** or the field for the attribute value. The name of **<Attribute n:>** can be edited and an attribute value can be typed in.	

Step	Description	Refer to chapter
☞	**LAST (F4)** recalls the last used attribute values which were stored with this point code.	
☞	**DEFLT (F5)** recalls the default attribute values for the selected code.	
7.	**STORE (F1)** stores the new point entered and all associated information and returns to **MANAGE Data: Job Name, Points** page. The properties stored with the point are: Class: **CTRL** Sub class: **Fixed (Pos & Ht)** Source: **User Entered** Instrument source: **TPS**	
☞	It may happen that a point with the same point ID exists in the job. If the codes and/or attribute values of the new and the existing point do not match, a screen opens where they can be corrected.	9.6

7.3.3 Editing a Point

Access

Refer to "7.2 Accessing Data Management" to access **MANAGE Data: Job Name**.

Edit point step-by-step

The following table explains the most common settings. Refer to the stated chapter for more information on screens.

Step	Description	Refer to chapter
1.	In **MANAGE Data: Job Name**, **Points** page highlight a point to be edited.	
2.	**EDIT (F3)** to access **MANAGE Edit Point: Point ID**. ☞ The visible pages on this screen depend on the properties of the point being edited.	
3.	**MANAGE Edit Point: Point ID**, **Coords** page It is possible to edit the point ID and for points of **<Class: CTRL>**. Other point related data is shown in output fields. ☞ Points of **<Class: REF>** cannot be renamed. ☞ Changing the point ID for a point of any class applies this new point ID to all other points with the same original name, regardless of class.	7.3.1
☞	**MORE (F5)** displays information about class, sub class, estimated 3D coordinate quality, time and date of when point was stored, instrument source and source. Changing the height type does not edit the point.	7.3.1
4.	Is **<Class: MEAS>**? • If **yes**, continue with step 5.	

Step	Description	Refer to chapter
	• If **no**, continue with step 7.	
5.	The edited point is **<Class: MEAS>**. **PAGE (F6)** changes to the **Obs** page.	
6.	**MANAGE Edit Point: Point ID**, **Obs** page It is possible to edit the reflector height. The station from where the point was measured is shown in an output field. The reflector height is shown and may be edited. Changing the reflector height recalculates the point height. The reflector type is shown in an output field. The distance variables **Δ**Hz, **Δ**V, **Δ**Slop Dist are shown in an output field, whenever a measurement has been taken in both faces.	
	MORE (F5) displays the horizontal angle or the azimuth from the point to the instrument.	
7.	**PAGE (F6)** changes to the **Code** page.	
8.	**MANAGE Edit Point: Point ID**, **Code** page The point code can be edited. All point codes in the job can be selected. The description of the code is shown as an output field. The attributes are shown as output, input or choicelist fields depending on their definition.	9.2 and 9.3

Step	Description	Refer to chapter
	The attribute values shown depend on **<Attributes:>** in **CONFIGURE Coding & Linework**. **<Attributes: Last Used>** shows the last used attribute values which are stored for this point code in the active codelist. **<Attributes: Default Values>** shows the default attribute values for this point code if existing.	
☞	**NEW-A (F2)** allows additional attributes to be created for this point code.	
☞	**NAME (F3)** or **VALUE (F3)** Available for attributes for which an attribute name can be typed in. To highlight **<Attribute n:>** or the field for the attribute value. The name of **<Attribute n:>** can be edited and an attribute value can be typed in.	
☞	**LAST (F4)** recalls the last used attribute values which were stored with this point code.	
☞	**DEFLT (F5)** recalls the default attribute values for the selected code.	
9.	Is **<Class: MEAS>** and no offset point? • If **yes**, continue with step 11. • If **no**, continue with step 10.	
10.	Is **<Class: AVGE>**? • If **yes**, continue with step 13. • If **no**, continue with step 15.	
11.	The edited point is **<Class: MEAS>** and no offset point.	

Step	Description	Refer to chapter
	PAGE (F6) changes to the **Annots** page.	
12.	**MANAGE Edit Point: Point ID, Annots** page The comments to be stored with the point can be edited. Continue with step 15.	
13.	The edited point is **<Class: AVGE>**. **PAGE (F6)** changes to the **Mean** page.	
14.	**MANAGE Edit Point: Point ID**, **Mean** page All points of **<Class: MEAS>** of the same point ID are listed sorted by time. The settings in the **Use** column can be edited. All functionality and keys are explained in a separate section.	7.3.4
15.	**STORE (F1)** stores the changes and returns to **MANAGE Data: Job Name**. ☞ An edited point retains the creation value for **<Time:>**. ☞ Changing coordinates of a point which has been previously used in other application programs, for example COGO, does not update the application results.	
☞	It may happen that a point with the same point ID exists in the job. If the codes and/or attribute values of the new and the existing point do not match, a screen opens where they can be corrected.	9.6

7.3.4 Mean Page

Description

- In order to check measurements, the same point can be measured more than once. These measured points are assigned the class **MEAS**. The various measured coordinate triplets for one point can be recorded using the same point ID. If the averaging mode is activated, an average is calculated when more than one measured coordinate triplet is available for the same point ID.
- The averaged point is given the class **AVGE**. It is checked if the deviations of each single point are within the limits configured in **MANAGE New Job, Avge** page or in **MANAGE Edit Job: Job Name, Avge** page.
- After averaging, the **Mean** page becomes available in **MANAGE Edit Point: Point ID** and accessible from the Survey application program **SURVEY Survey: Job Name, Survey** page.
- Available functionality on the **Mean** page depends on the selected averaging mode.

Averaging

Averaging Mode

The averaging mode defines the checks which are performed when more than one set of measured coordinates are recorded for the same point. The selected averaging mode also affects the behaviour of the instrument when editing a point and calculating averages.

Defining the averaging mode and configuring the limits

The averaging mode and the limits are configured in **MANAGE New Job, Avge** page or in **MANAGE Edit Job: Job Name, Avge** page. Refer to "6.3 Creating a New Job" and to "6.4 Editing a Job".

Description of averaging modes

Averaging mode	Description
Average	When more than one measured coordinate triplet is recorded for the same point, the average for the position and the height is computed. Depending on the selected averaging method, the average will be computed weighted or arithmetic (no weighting). The class **AVGE** is assigned to the averaged point. The horizontal and height distances from the measured points to the average are computed and displayed on the **Mean** page. A check is performed that the differences for the position and height components between the **averaged point** and the point being stored does not exceed the defined limits.
Absolute Diffs	What is described above for **Average** applies for **Absolute Diffs.** Additionally, the **absolute difference** between two points selected from a list of measured points which are all stored with the same point ID are computed and checked for being within the defined limits.
Off	Averaging functionality is turned off. With more than one measured coordinate triplet recorded for the same point, no average for the position and the height is computed.

Averaging with position only or height only points

Position only points, height only points and points with full coordinate triplets are handled in the averaging.

Access step-by-step

The **Mean** page can be accessed if

<Averaging Mode: Average> or **<Averaging Mode: Absolute Diffs>** is configured in **MANAGE New Job, Avge** page or in **MANAGE Edit Job: Job Name, Avge** page.

AND

more than one measured coordinate triplet is recorded for the same point using the same point ID.

Access within data management

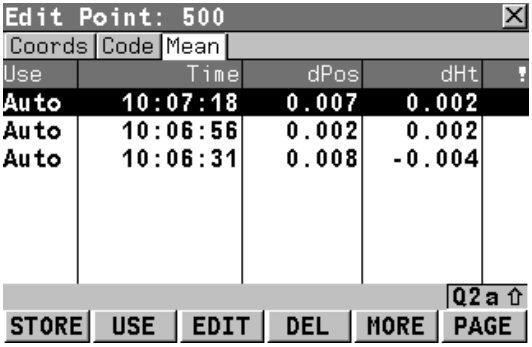
Step	Description
1.	Refer to "7.2 Accessing Data Management" to access **MANAGE Data: Job Name**.
2.	In **MANAGE Data: Job Name**, **Points** page highlight a point to be edited.
3.	**EDIT (F3)** to access **MANAGE Edit Point: Point ID, Mean** page.

Access within Survey

Step	Description
1.	**Main Menu: Survey** to access **SURVEY Survey Begin**.
2.	**CONT (F1)** to access **SURVEY Survey: Job Name**, **Survey** page.
3.	**SHIFT AVGE (F2)** or **SHIFT ABS (F2)** to access **SURVEY Edit Point: Point ID**, **Mean** page.

MANAGE
Edit Point: Point ID, Mean page

All measured coordinate triplets recorded using the same point ID are shown.



STORE (F1)
To store the changes and to return to the screen from where this screen was accessed.

USE (F2)
To change between the options in the **Use** column for the highlighted coordinate triplet. To include or exclude this triplet in or from the calculation of the average. Refer to "Description of columns" below.

EDIT (F3)
To view and edit the highlighted measured coordinate triplet. It is possible to edit the point ID and the reflector height without impact on all other classes of the point with the same original name. The coordinates are updated. Codes cannot be changed. The average point has the higher priority. A change in codes must be an overall change for the average point.
Example: One of the measured coordinate triplets has a wrong point ID and should not be included in the average. By editing the point ID, the point is renamed and no longer contributes to the average.

DEL (F4)
To delete the highlighted coordinate triplet. The average is recomputed.

MORE (F5)
To change between time and date of when the point was stored and the 3D coordinate quality.

PAGE (F6)
To change to another page on this screen.

SHIFT DIFFS (F5)
Available for **<Averaging Mode: Absolute Diffs>** and **Yes** is set in the **Use** column for exactly two measurements. To display the absolute coordinate differences. Differences exceeding the defined limit are indicated by ▼.

Description of columns

Column	Description
Use	The use of a measured coordinate triplet in the averaging. • **Auto** The coordinate triplet is included in the averaging computation if within the averaging limit defined in **MANAGE New Job, Avge** page or in **MANAGE Edit Job: Job Name, Avge** page. • **Yes** The coordinate triplet is always included in the averaging computation even if it would fall outside the averaging limit defined in **MANAGE New Job, Avge** page or in **MANAGE Edit Job: Job Name, Avge** page. • **No** The coordinate triplet is never included in the averaging computation. • ----- The coordinate triplet cannot be included in the averaging computation. Automatically set by the system.

Column	Description
	USE (F2) changes between the options.
Time	The time the measured coordinate triplet was stored.
Date	The date the measured coordinate triplet was stored. The format is as defined in **CONFIGURE Units & Formats**, **Time** page.
dPos	The horizontal distance from the measured coordinate triplet to the average. **<dPos: ----->** indicates unavailable information, for example for a height only point.
dHt	The height distance from the measured coordinate triplet to the average. **<dHt: ----->** indicates unavailable information, for example for a position only point.
!	Available for measured coordinate triplets with **Auto** or **Yes** in the **Use** column if **<Averaging Mode: Average>**. Indicates an exceeding of the limits.

Next step

IF a measured coordinate triplet	THEN
is not to be viewed	**STORE (F1)** stores the changes and returns to **MANAGE Data: Job Name**.
is to be viewed	highlight a measured coordinate triplet and **EDIT (F3)**.

7.4 Line/Area Management

7.4.1 Overview

Description

A line/area consists of points and can be created/edited in **MANAGE Data: Job Name**. The individual points are measured within any application program. These can be all points. Points can be simultaneously assigned to one or more lines and/or areas.

A line/area can have

- a style for display in MapView.
- a code independent of the point code of the points comprising the line/area.

Points are assigned to a line/area when the line/area is open. Refer to "7.2 Accessing Data Management" for information on how to open a line/area.

7.4.2 Creating a New Line/Area

The functionality of all screens and fields are similar for the creation of both lines and areas. The step-by-step instructions for creating a new line can be applied for areas.

Access

Refer to "7.2 Accessing Data Management" to access **MANAGE Data: Job Name**.

Create line step-by-step

The following table explains the most common settings. Refer to the stated chapter for more information on screens.

Step	Description	Refer to chapter
1.	**MANAGE Data: Job Name**	
2.	**PAGE (F6)** until the **Lines (X)** page is active.	
3.	**MANAGE Data: Job Name**, **Lines (X)** page	
4.	**NEW (F2)** to access **MANAGE New Line**.	
5.	**MANAGE New Line, General** page **<Line ID:>** The name of the new line. The configured ID template for lines is used. The ID can be changed. • To start a new sequence of line ID's overtype the line ID. • For an individual name independent of the ID template **SHIFT INDIV (F5)**. **SHIFT RUN (F5)** changes back to the next ID from the configured ID template. **<Pts to Store:>** The type of points which are used to form the line during a survey. Select between all points, measured points, auto points and offset points of type 1 or 2.	36.1, 36.4

Step	Description	Refer to chapter
	<Line Style:> This is the line style in which lines/areas are represented in MapView and Stonex® Tools. For **<Line Code: <None>>** on the Code page a line style can be selected from a choicelist. Otherwise the line style as defined for the selected line code is shown. Type in a number for the line, select the points to be stored with the line and select a line style if necessary.	
6.	**PAGE (F6)** changes to the **Code** page.	
7.	**MANAGE New Line**, **Code** page The setting for **<Thematc Codes:>** in **CONFIGURE Coding & Linework** determines the availability of the subsequent fields and softkeys. • For **<Thematc Codes: With Codelist>**: The codes from the job codelist are used. **<Line Code:>** All line codes of the job codelist can be selected. The description of the code is shown as an output field. The line style is shown as defined for the selected line code. It is the style in which lines/areas are represented in MapView and Stonex® Tools. For **<Line Code: <None>>**, it can be changed. The attributes are shown as output, input or choicelist fields depending on their definition.	15.3

Step	Description	Refer to chapter
	• For **<Thematc Codes: Without Codelist>**: Codes for lines can be typed in but not selected from a codelist. **<Line Code:>** The line code to be stored with the point. A check is performed to see if a line code of this name already exists in the job. If so, the according attributes are displayed. **<Attribute n:>** Up to eight attribute values are available. Type in a code.	
8.	Is **<Thematc Codes: With Codelist>**? • If **yes**, continue with the next row. • If **no**, continue with step 9.	
☞	**NEW-A (F2)** allows additional attributes to be created for this line code.	
☞	**NAME (F3)** or **VALUE (F3)** Available for attributes for which an attribute name can be typed in. To highlight **<Attribute n:>** or the field for the attribute value. The name of **<Attribute n:>** can be edited and an attribute value can be typed in.	
☞	**LAST (F4)** recalls the last used attribute values which were stored with this line code.	
☞	**DEFLT (F5)** recalls the default attribute values for the selected code.	
9.	**STORE (F1)** stores the new line entered and all associated information and returns to **MANAGE Data: Job Name, Lines (X)** page.	

Step	Description	Refer to chapter
	The value for **<Start Time:>** with which the line is stored is the time when **STORE (F1)** was pressed. The same value is assigned to the value for **<End Time:>** until a point is added to the line.	7.4.3
☞	Any existing lines and areas which are open are closed.	

Creating lines/areas most efficiently

IF the task is to create	THEN
multiple lines/areas with subsequent line/area ID's	use the user menu function **FUNC Create New Line (Quick)**/**FUNC Create New Area (Quick)**. Selecting the function from the user menu creates and immediately stores the new line/area. For the line/area ID, the line/area ID template as defined in **CONFIGURE ID Templates** is used. The code and attributes are taken over from the last created line/area.
lines/areas with certain codes	use quick coding. The job codelist must contain quick codes for lines/areas. By tying the quick code a new line/area is created and immediately stored with that line/area code and attributes. For the line/area ID, the line/area ID template as defined in **CONFIGURE ID Templates** is used.

7.4.3 Editing a Line/Area

The functionality of all screens and fields are similar for the editing of both lines and areas. The step-by-step instructions for editing a new line can be applied for areas.

Access

Refer to "7.2 Accessing Data Management" to access **MANAGE Data: Job Name**.

Edit line step-by-step

The following table explains the most common settings. Refer to the stated chapter for more information on screens.

Step	Description	Refer to chapter
1.	**MANAGE Data: Job Name**	
2.	**PAGE (F6)** until the **Lines** page is active.	
3.	In **MANAGE Data: Job Name**, **Lines** page highlight a line to be edited.	
4.	**EDIT (F3)** to access **MANAGE Edit Line: Line ID**.	
5.	**MANAGE Edit Line: Line ID**, **General** page The line ID and the type of points which are used to form the line during a survey can be edited. Other line related data is shown in output fields. **<No. of Pts:>** The number of points contained within the line. **<Length:>** The sum of the distances between the points in the sequential order in which they are stored for the line. **<Start Time:>** and **<Start Date:>** The time/date when the line was created. A line cannot be renamed to an already existing line ID.	

Step	Description	Refer to chapter
☞	**MORE (F5)** displays **<End Time:>** and **<End Date:>**. This is the time/date when the last point was added to the line. This can be different to the time the point was created. The values do not change after deleting the last added point or after editing unless an additional point is added to the line.	
6.	**PAGE (F6)** changes to the **Points** page.	
7.	**MANAGE Edit Line: Line ID**, **Points** page All points belonging to the line are listed. The point that was added last to the line is at the top of the list.	
☞	**ADD (F2)** Accesses **MANAGE Select Point** with the **Points** and **Map** page. To add an existing point from the active job to the line. A new point is added above the point which was highlighted when **ADD (F2)** was pressed.	7.2.
☞	**EDIT (F3)** edits the highlighted point.	7.3.3.
☞	**REMOV (F4)** removes the highlighted point from the line. The point itself is not deleted.	
☞	**MORE (F5)** displays information about the point codes if stored with the line, the time and the date of when the line was stored, the 3D coordinate quality, the class and the flag for Linework.	7.3.1
8.	**PAGE (F6)** changes to the **Code** page.	
9.	**MANAGE Edit Line: Line ID**, **Code** page	9

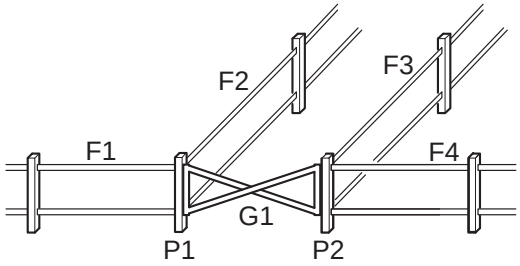
Step	Description	Refer to chapter
	The line code can be edited. All line codes can be selected. For **<Line Code: <None>>**, the line style can be changed. The description of the code is shown as an output field. The attributes are shown as output, input or choicelist fields depending on their definition.	
☞	**NEW-A (F2)** allows additional attributes to be created for this line code.	
☞	**NAME (F3)** or **VALUE (F3)** Available for attributes for which an attribute name can be typed in. To highlight **<Attribute n:>** or the field for the attribute value. The name of **<Attribute n:>** can be edited and an attribute value can be typed in.	
☞	**LAST (F4)** recalls the last used attribute values which were stored with this line code.	
☞	**DEFLT (F5)** recalls the default attribute values for the selected code.	
10.	**STORE (F1)** stores the changes and returns to **MANAGE Data: Job Name, Lines** page.	
☞	An edited line retains the creation value for **<Start Time:>**. The value for **<End Time:>** changes when a point was added to the line.	

7.4.4 Working Example

Description

Application:	Pick up points along fence lines with a gate. The gate can also be represented as a line. Some points belong to more than one line.
Setting:	**F7** is configured to access the **MANAGE Data: Job Name** screen. Refer to "2 USER Key" on how to configure hot keys.
Goal:	Each point is to be picked up once.

Diagram



P1	Gate post
P2	Gate post
F1	First fence line
F2	Second fence line
F3	Third fence line
F4	Fourth fence line
G1	Gate

Field procedure step-by-step

The following table explains the most common settings. Refer to the stated chapter for more information on screens.

Step	Description	Refer to chapter
1.	Create the lines F1, F2 and G1.	7.4.2
2.	Start Survey application program.	35.1

Step	Description	Refer to chapter
3.	Press **F7.**	
4.	**MANAGE Data: Job Name, Lines (X)** page The line F1 must be open, the lines F2 and G1 must be closed. To open/close a line, highlight the line and **CLOSE (F4)** and **OPEN (F4)**.	
5.	**CONT (F1)**	
6.	**SURVEY Survey: Job Name** Measure points along fence line F1 until the last point before P1. These points are automatically added to line F1.	
	Points can be coded separately.	
7.	Press **F7.**	
8.	**MANAGE Data: Job Name, Lines (X)** page Highlight the line F2. **OPEN (F4)** to open the line.	
9.	Highlight the line G1. **OPEN (F4)** to open the line.	
	Line F1 stays open.	
10.	**CONT (F1)**	
11.	**SURVEY Survey: Job Name** Measure P1. This point is automatically added to all three lines open at that time.	35.1

Step	Description	Refer to chapter
12.	Press **F7.**	
13.	**MANAGE Data: Job Name, Lines (X)** page Highlight the line F1. **CLOSE (F4)** to close the line.	
14.	Highlight the line F2. **CLOSE (F4)** to close the line.	
☞	Line G1 stays open.	
15.	**CONT (F1)**	
16.	**SURVEY Survey: Job Name** Measure points along gate G1. These points are automatically added to line G1.	35.1
17.	After finishing the survey, import the data into a CAD package. If the line codes required by the CAD package were used, the lines are automatically connected and the point symbols are automatically set.	

7.5 Data Log

Description

A list of all objects and free codes in the active job is displayed in order of time.

Access step-by-step

Access within data management

Step	Description
1.	Refer to "7.2 Accessing Data Management" to access **MANAGE Data: Job Name**.
2.	In **MANAGE Data: Job Name** on the **Points** page, **SHIFT LOG (F4)** to access **MANAGE Data Log: Job Name**.

Access within job management

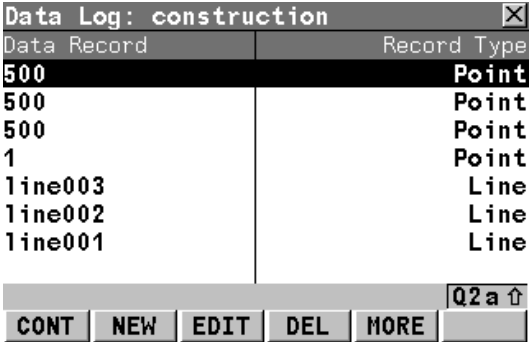
Step	Description
1.	**Main Menu: Manage...\Jobs** to access **MANAGE Jobs (Device)**. Refer to "6.2 Accessing Job Management" for further options to access this screen.
2.	In **MANAGE Jobs (Device)** highlight a job to be edited.
3.	**EDIT (F3)** to access **MANAGE Edit Job: Job Name**.
4.	**SHIFT LOG (F5)** to access **MANAGE Data Log: Job Name**.

Access by user defined menu

Press **USER**. Refer to "2 USER Key" for information on the **USER** key.

MANAGE Data Log: Job Name

In the column **Data Record**, all points, lines and areas as well as free codes stored within the active job are displayed. They are always sorted by time with the most recent record at the top. For lines and areas, the value for **<Start Time:>** is relevant.



CONT (F1)
To close the screen and return to the screen from where this screen was accessed.

NEW (F2)
To insert a free code below, this means timewise before, the currently highlighted object or record. The functionality of inserting a free code is identical to the functionality of entering a free code during a survey. Refer to "9.3 Free Coding".

EDIT (F3)
To edit the highlighted object or free code. Refer to "7.3.3 Editing a Point", "7.4.3 Editing a Line/Area". The functionality of editing a free code is identical to the functionality of entering a free code during a survey. Refer to "9.3 Free Coding" .

DEL (F4)
To delete the highlighted object or free code.

MORE (F5)
To display information about the type of data recorded, the time and the date of when it was stored or for lines and areas when they were created and the codes if stored with any object.

Next step

CONT (F1) returns to the screen from where **MANAGE Data Log: Job Name** was accessed.

7.6 Point Sorting and Filters

7.6.1 Sorting and Filters for Points, Lines and Areas

Description

The sort settings define the order of the objects in the active job. The filter settings define the objects to be viewed.

Three types of filters are available:

Point filter:	An active point filter shows selected points in **MANAGE Data: Job Name**, **Points** page.
Line filter:	An active line filter shows selected lines in **MANAGE Data: Job Name**, **Lines (X)** page.
Area filter:	An active area filter shows selected areas in **MANAGE Data: Job Name**, **Areas (X)** page.

The sort and filter settings are stored in the job. They are remembered after turning off the instrument and are copied to a new job.
When a job becomes active, then the sort and filter settings of this job are saved in the SystemRAM. If the CompactFlash card is formatted then these last used sort and filter settings are used for the job **Default**.

Changing the active job does influence the sort settings for the objects. The filter settings are set to those of the selected job.

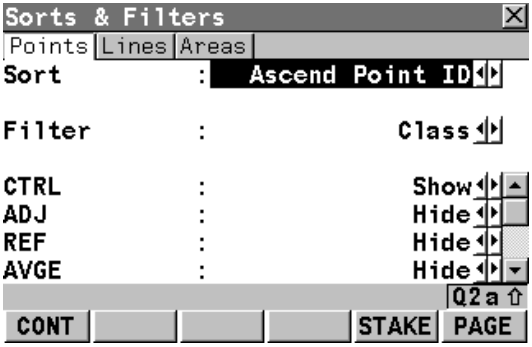
An active filter for an object is indicated in **MANAGE Data: Job Name** by ⏷ located on the right hand side of the page name.

Access step-by-step

Step	Description
1.	Refer to "7.2 Accessing Data Management" to access **MANAGE Data: Job Name**.
2.	In **MANAGE Data: Job Name** on the **Points**, **Lines** or **Areas** page, **SHIFT FILT (F5)** to access **MANAGE Sorts & Filters**.
3.	**MANAGE Sorts & Filters** This screen consists of three pages, one for each type of object. The page for an object is displayed when the equivalent page is displayed in **MANAGE Data: Job Name**.

MANAGE Sorts & Filters, Points page

The available fields on this screen depend on the selected setting for **<Filter:>**.



CONT (F1)
To close the screen and return to the screen from where this screen was accessed. The selected sort and filter settings are applied.

CODES (F4)
Available for **<Filter: Point Code>**. To select the line codes to be used.

STAKE (F5)
To filter points for the Stakeout application program. Refer to "7.6.3 Stakeout Filter".

PAGE (F6)
To change to another page on this screen.

Description of fields

Field	Option	Description
<Sort:>	**Ascend Point ID**, **Descend Point ID**, **Forward Time** or **Backward Time**	Always available. The method points are sorted by.
<Filter:>		Always available. The method the points are filtered by.
	No Filter	Shows all points.
	Highest Class	Shows points of highest class.
	Range of Pt ID's	Shows points with point ID's between the entered start and end ID. The points are left aligned and sorted by the first digit.
	Pt ID Wildcard	Shows points with point ID's matching the wild-card.
	Time	Shows points which were recorded within a defined time window.
	Class	Shows points of the selected class.
	Point Code	Shows points with selected codes attached. Refer to "7.6.2 Point, Line and Area Code Filter".
	Radius From Pt	Shows points within the defined radius from a particular point. The radius is the horizontal distance.

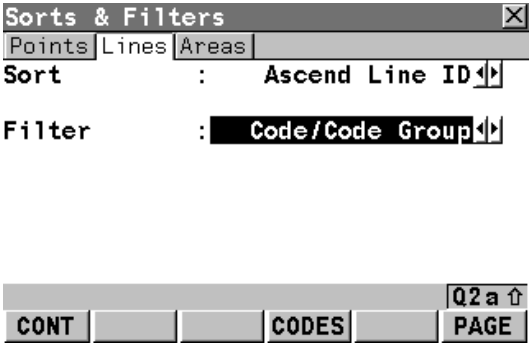
Field	Option	Description
	Individual Line	Shows points forming a selected line. This may for example be useful during stakeout.
	Individual Area	Shows points forming a selected area. This may for example be useful during stakeout.
<Start ID:>	User input	Available for **<Filter: Range of Pt ID's>**. The first point to be displayed.
<End ID:>	User input	Available for **<Filter: Range of Pt ID's>**. The last point to be displayed.
<Wildcard:>	User input	Available for **<Filter: Pt ID Wildcard>**. * and ? are supported. * indicates an undefined number of unknown characters. ? indicates a single unknown character.
<Start Date:>	User input	Available for **<Filter: Time>**. The date of the first point to be displayed.
<Start Time:>	User input	Available for **<Filter: Time>**. The time of the first point to be displayed.
<End Date:>	User input	Available for **<Filter: Time>**. The date of the last point to be displayed.
<End Time:>	User input	Available for **<Filter: Time>**. The time of the last point to be displayed.

Field	Option	Description
<CTRL:>, <ADJ:>, <REF:>, <AVGE:>, <MEAS:>, <EST:>, <NONE:>	**Show** or **Hide**	Available for **<Filter: Class>**. Defined classes are shown or hidden.
<View:>	**Highest Triplet** **All Triplets**	Available for **<Filter: Class>**. The coordinate triplets of the highest class are shown. All classes for one coordinate triplet are shown.
<Point ID:>	Choicelist	Available for **<Filter: Radius From Pt>**. The point to which the radius is applied. Opening the choicelist opens **MANAGE Data: Job Name**. Refer to "7.2 Accessing Data Management".
<Radius:>	User input	Available for **<Filter: Radius From Pt>**. The radius of the circle within which the points are shown.
<Line ID:>	Choicelist	Available for **<Filter: Individual Line>**. Opening the choicelist opens **MANAGE Data: Job Name**. Refer to "7.2 Accessing Data Management".
<Area ID:>	Choicelist	Available for **<Filter: Individual Area>**. Opening the choicelist opens **MANAGE Data: Job Name**. Refer to "7.2 Accessing Data Management".

Next step

PAGE (F6) changes to the **Lines** page. Refer to paragraph "MANAGE Sorts & Filters, Lines page".

MANAGE Sorts & Filters, Lines page



CONT (F1)
To close the screen and return to the screen from where this screen was accessed. The selected sort and filter settings are applied and the lists in **MANAGE DATA: Job Name** are updated.

CODES (F4)
Available for **<Filter: Code/Code Group>**. To select the line codes to be used.

PAGE (F6)
To change to another page on this screen.

Description of fields

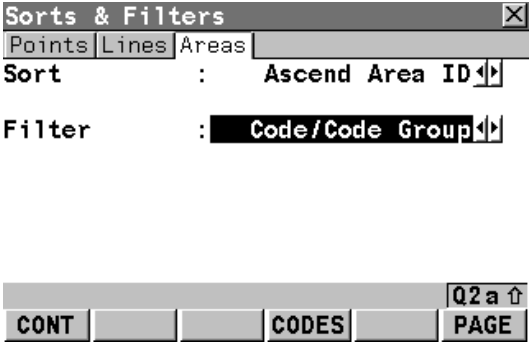
Field	Option	Description
<Sort:>	**Ascend Line ID**, **Descend Line ID**, **Fwrd Start Time**, **Bwrd Start Time**, **Fwrd End Time** or **Bwrd End Time**	Always available. The method the lines are sorted by.
<Filter:>		Always available. The method by which the lines are filtered.
	No Filter	Shows all lines.

Field	Option	Description
	Code/Code Group	Shows lines with selected codes attached. Refer to "7.6.2 Point, Line and Area Code Filter" since the functionality is identical to the point code filter.

Next step

PAGE (F6) changes to the **Areas** page. Refer to paragraph "MANAGE Sorts & Filters, Areas page".

MANAGE
Sorts & Filters,
Areas page



CONT (F1)
To close the screen and return to the screen from where this screen was accessed. The selected sort and filter settings are applied and the lists in **MANAGE DATA: Job Name** are updated.

CODES (F4)
Available for **<Filter: Code/Code Group>**. To select the area codes to be used.

PAGE (F6)
To change to another page on this screen.

Description of fields

The functionality of setting the filters is identical to those on the **Lines** page. Refer to paragraph "MANAGE Sorts & Filters, Lines page".

Next step

CONT (F1) returns to the screen from where **MANAGE Sorts & Filters** was accessed.

7.6.2 Point, Line and Area Code Filter

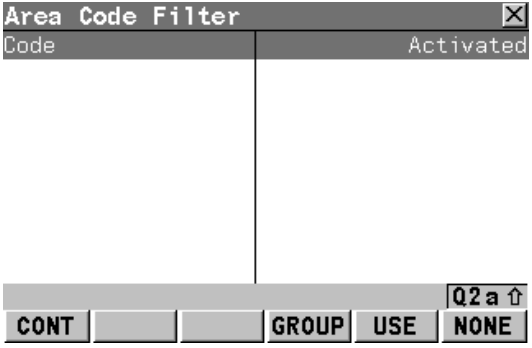
For each object, a code filter exists. The point, line and area code filters are independent from each other. The functionality is identical. For simplicity, the point code filter is explained.

Access step-by-step

Step	Description
1.	Refer to "7.6.1 Sorting and Filters for Points, Lines and Areas" to access **MANAGE Sorts & Filters**.
2.	Select **<Filter: Point Code>**.
3.	**CODES (F4)** to access **MANAGE Point Code Filter**.

MANAGE Point Code Filter

This screen shows the point codes from the active job and codes currently used as filter. Point codes are sorted according to the settings in **MANAGE Sort Codes**.



CONT (F1)
To close the screen and return to the screen from where this screen was accessed.

GROUP (F4)
To activate and deactivate code groups. Accesses **MANAGE Code Groups**. Any code group that have been previously deactivated are displayed as deactivated here. Codes belonging to a deactivated code group are not displayed in **MANAGE Code Filter**. Refer to "8.6 Managing Code Groups".

USE (F5)
To activate and deactivate the filter for the highlighted code.

NONE (F6) or **ALL (F6)**
To deactivate or activate all point codes.

SHIFT SORT (F5)
To define the order of the codes. Accesses **MANAGE Sort Codes**.

7.6.3 Stakeout Filter

Description

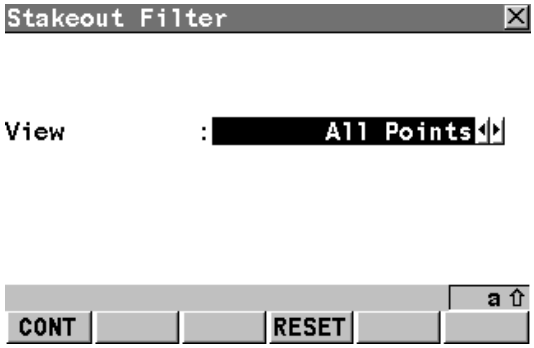
The settings on this screen define a filter for the Stakeout application program, for example to show points which are already staked or points that are still to be staked.

The stakeout filter acts in addition to any other filter set in **MANAGE Sorts & Filters**.
For example, points still to be staked out with a particular code can be filtered.

Access step-by-step

Step	Description
1.	Refer to "7.6.1 Sorting and Filters for Points, Lines and Areas" to access **MANAGE Sorts & Filters**.
2.	In **MANAGE Sorts & Filters**, **PAGE (F6)** until the **Points** page is active.
3.	**STAKE (F5)** to access **MANAGE Stakeout Filter**.

MANAGE Stakeout Filter



CONT (F1)
To close the screen and return to the screen from where this screen was accessed.

RESET (F4)
To reset the staked flag for all points of the currently active job.

Description of fields

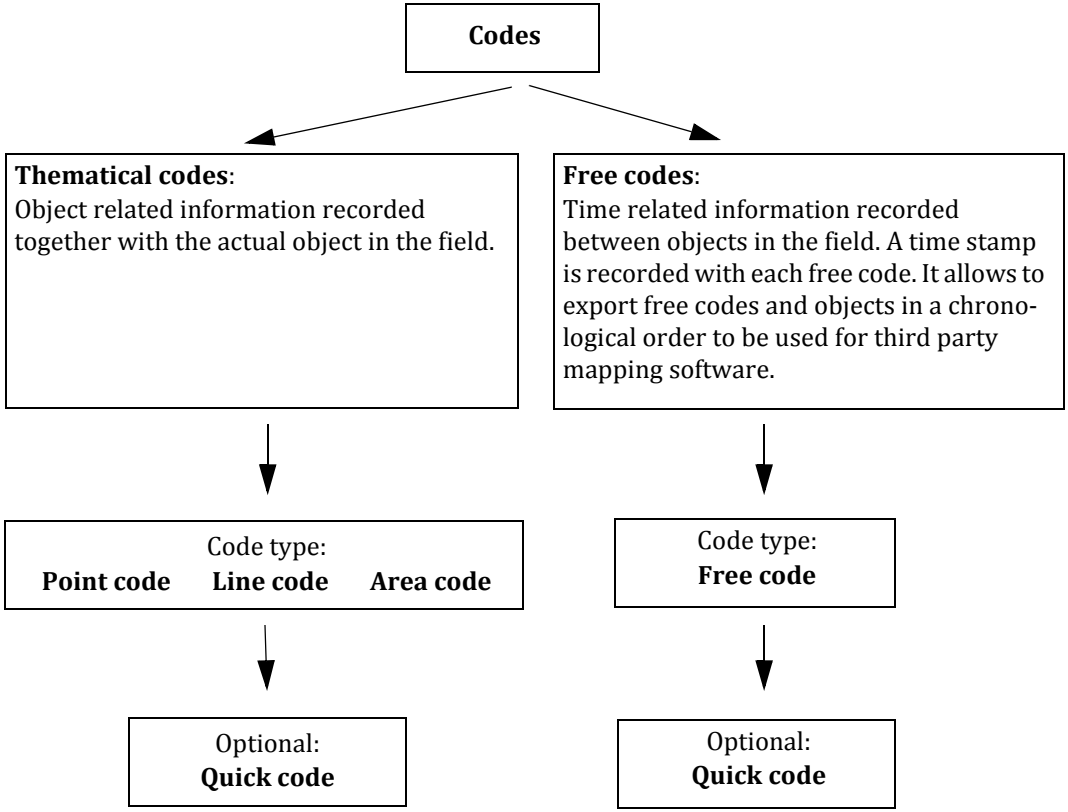
Field	Option	Description
<View:>	**All**	Shows all points.
	Pts to Stakeout	Shows points not yet staked out.
	Staked Points	Shows points which are already staked out.

8 Manage...\Codelists

8.1 Terminology

Description	This chapter describes technical terms related to codes and codelists.
☞	The values for code groups, codes and attributes are case sensitive. For example the code group Tree is not the same as the code group TREE.
Object	For coding, points, lines and areas have the same behaviour. In this chapter, object is used as generic term for points, lines and areas.
Code group	A code group allows codes belonging to the same theme to be grouped together. Individual groups can be activated or deactivated. The codes belonging to a deactivated code group cannot be selected from the choicelist for code selection.
Code	**Description** A code is a description which can be stored with an object or alone.

Structure of codes


Codes
Thematical codes:
Object related information recorded together with the actual object in the field.
Free codes:
Time related information recorded between objects in the field. A time stamp is recorded with each free code. It allows to export free codes and objects in a chrono-logical order to be used for third party mapping software.
Code type:
Point code
Line code
Area code
Code type:
Free code
Optional:
Quick code
Optional:
Quick code

Code types

The code type defines how and for which objects a code can be used. It is possible to create a code of the same name but of different code types both on the instrument and in Stonex® Tools. Example: The code Oak can exist with code type point code and with code type line code.

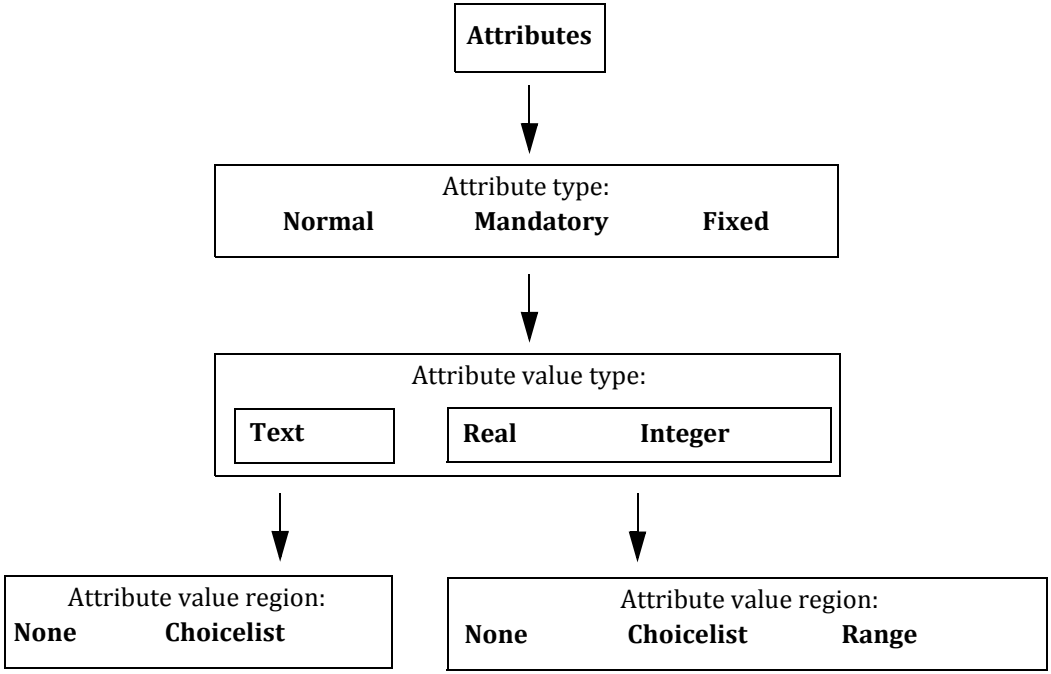
Point code:	To record a code directly with a point. This is thematical point coding.
Line code:	To record a code directly with a line. This is thematical line coding.
Area code:	To record a code directly with an area. This is thematical area coding.
Free code:	To record a code based on time in between objects.
Quick code:	To start a point measurement and store the code by typing in one, two or three predefined digits.

Attribute

Description

The use of attributes allows additional information to be stored with the code. Up to twenty attributes can be related to one code. Attributes are not compulsory.

Structure of attributes



Attribute types

The attribute type defines the input requirements for the attribute.

Normal:	An input for the attribute is optional. The attribute value can be typed in in the field. New attributes with this attribute type can be created in Stonex® Tools or on the instrument.
Mandatory:	An input for the attribute is compulsory. The attribute value must be typed in the field. New attributes with this attribute type can be created in Stonex® Tools.
Fixed:	The attribute value is a predefined default which is displayed but cannot be changed in the field. This attribute value is automatically attached to the code. New attributes with this attribute type can be created in Stonex® Tools.

Attribute value types

The attribute value type defines which values are accepted as input.

Text:	Any input for the attribute is interpreted as text. New attributes with this attribute value type can be created in Stonex® Tools or on the instrument.
Real:	An input for the attribute must be a real number, for example 1.23. New attributes with this attribute value type can be created in Stonex® Tools.
Integer:	An input for the attribute must be an integer number, for example 5. New attributes with this attribute value type can be created in Stonex® Tools.

Attribute value regions

The attribute value region defines if the attribute values must be selected from a predefined list.

None: An input for the attribute must be typed in. New attributes with this attribute value region can be created in Stonex® Tools or on the instrument.

Range: An input for the attribute must fall within a predefined range. New attributes with this attribute value region can be created in Stonex® Tools.

Choicelist: An input for the attribute is selected from a predefined list. New attributes with this attribute value region can be created in Stonex® Tools.

Example

Code	Attributes	Attribute value type	Attribute value region	Example for the attribute value region
Birch	Height	Real	Range	0.5-3.0
	Condition	Text	Choicelist	Good, Dead, Damaged
	Remark	Text	None	-

Codelist

Description

A codelist is a collection of codes that can be used to describe surveyed objects in the field.

Elements of a codelist

- Code group
- Code
- Attributes

Structure of a codelist

Structure	Example

Codelist
├── Code group 1
│ ├── Code 1.1
│ │ ├── Attribute 1.1.1
│ │ ├── Attribute ...
│ │ └── Attribute 1.1.20
│ ├── Code 1.2
│ │ ├── Attribute 1.2.1
│ │ ├── Attribute ...
│ │ └── Attribute 1.2.20
│ └── Code ...
└── Code group 2
  ├── Code 2.1
  │ ├── Attribute 2.1.1
  │ └── ...
	Codelist
	├── Trees
	│ ├── Birch
	│ │ ├── Height
	│ │ ├── Condition
	│ │ └── Remark
	│ ├── Oak
	│ │ ├── Circumference
	│ │ ├── Condition
	│ │ └── ...
	│ └── ...
	└── Infrastructure
	  ├── Road
	  │ ├── Material
	  │ └── ...

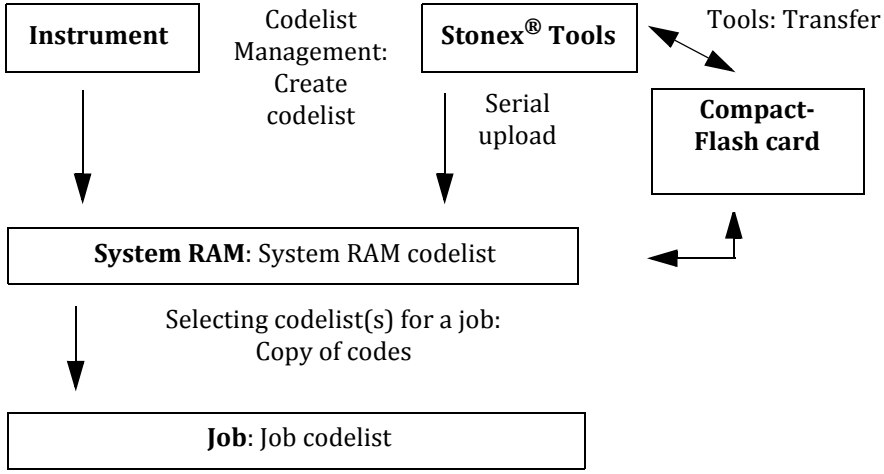
Codelist types

System RAM codelist: A codelist stored in the System RAM of the instrument.
Job codelist: The collection of codes contained within the currently active job.

8.2 Overview

It is recommended to create a codelist in Stonex® Tools. A codelist can be transferred from Stonex® Tools to the System RAM of the instrument using the CompactFlash card.

Steps from creating to using a codelist



The creating, editing and managing of codelists is explained in this chapter.
In order to use a codelist on the instrument, it must be transferred from the CompactFlash card to the System RAM. Refer to "22 Tools...\Transfer Objects...".

8.3 Accessing Codelist Management

Access

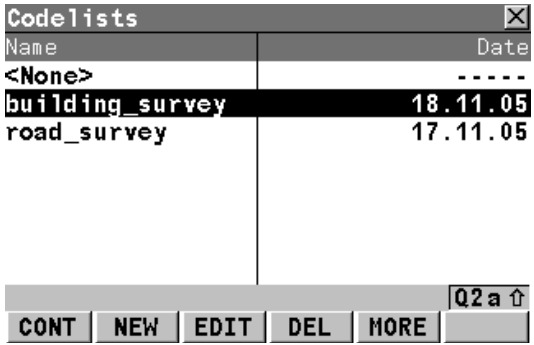
Select **Main Menu: Manage...\Codelists**.

OR

From a choicelist in some screens, for example **MANAGE New Job, Codelist** page.

MANAGE Codelists

Listed are all codelists stored in the System RAM.



CONT (F1)
To return to the screen from where this screen was accessed. If this screen was accessed from a choicelist, the codes from the highlighted codelist are copied to the active job.

NEW (F2)
To create a codelist. Refer to "8.4 Creating/Editing a Codelist".

EDIT (F3)
To edit the highlighted codelist. Refer to "8.4 Creating/Editing a Codelist".

DEL (F4)
To delete the highlighted codelist.

MORE (F5)
To display information about the creator and the date of when the codelist was created.

Next step

IF a codelist	THEN
is to be selected	highlight the desired codelist. **CONT (F1)** copies the codes of the codelist to the active job, closes the screen and returns to the screen from where **MANAGE Codelists** was accessed.
is to be created	**NEW (F2)**. Refer to "8.4 Creating/Editing a Codelist".
is to be edited	highlight the codelist and **EDIT (F3)**. Refer to "8.4 Creating/Editing a Codelist".

8.4 Creating/Editing a Codelist

Access

Refer to "8.3 Accessing Codelist Management" to access **MANAGE Codelists**.

Create/edit a codelist step-by-step

The following table explains the most common settings. Refer to the stated chapter for more information on screens.

Step	Description	Refer to chapter
1.	**MANAGE Codelists** **NEW (F2)** or **EDIT (F3)** to access **MANAGE XX Codelist**.	8.3
2.	**MANAGE New Codelist** or **MANAGE Edit Codelist** **<Name:>** A unique name for the codelist. The name may be up to 16 characters long and may include spaces. Input required. **<Description:>** A detailed description of the codelist. This can be for example, work to be performed. Input optional. **<Creator:>** The person's name who is creating the new codelist. Input optional.	
	CODES (F4) accesses **MANAGE Codes** where codes can be created, edited or deleted and code groups can be accessed.	8.5.2, 8.5.3 or 8.6
3.	**STORE (F1)** stores the codelist and returns to **MANAGE Codelists**.	

8.5 Managing Codes

8.5.1 Accessing MANAGE Codes

Description

Managing codes includes

- creating new codes
- viewing codes with their related information
- editing codes.
- deleting existing codes.

Access step-by-step

Step	Description
1.	Refer to "8.3 Accessing Codelist Management" to access **MANAGE Codelists**.
2.	In **MANAGE Codelists** highlight the codelist of which codes are to be managed.
3.	**EDIT (F3)** to access **MANAGE Edit Codelist**.
4.	**CODES (F4)** to access **MANAGE Codes**. This screen is described below.

MANAGE Codes

Codes from currently active code groups are shown.

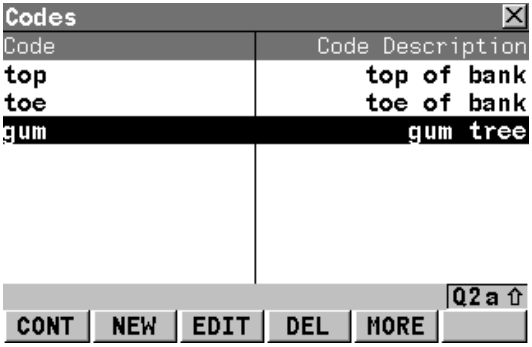
The listed code groups belong to

the selected System RAM codelist when this screen was accessed through **Main Menu: Manage...\Codelists**.

OR

to the job codelist when **MANAGE Codes** was accessed from an application program, **MANAGE New Job** or **MANAGE Edit Job**.

The ⊟ indicates codes which have attributes attached.



CONT (F1)
To close the screen and return to the screen from where this screen was accessed.

NEW (F2)
To create a new code. Refer to "8.5.2 Creating a New Code".

EDIT (F3)
To edit the highlighted code. Refer to "8.5.3 Editing a Code".

DEL (F4)
To delete the highlighted code.

MORE (F5)
To display information about the code description, the quick codes if available, the code groups and the code type.

SHIFT GROUP (F4)
To view, create, delete, activate and deactivate code groups. Refer to "8.6 Managing Code Groups".

SHIFT SORT (F5)
To sort codes by code name, code description, quick code or the last use.

Next step

IF	THEN
a code is to be created	**NEW (F2)**. Refer to "8.5.2 Creating a New Code".
a code is to be edited	highlight the code and **EDIT (F3)**. Refer to "8.5.3 Editing a Code".
code groups are to be accessed	**SHIFT GROUP (F4)**. Refer to "8.6 Managing Code Groups".

8.5.2 Creating a New Code

Create a new code step-by-step

The following table explains the most common settings. Refer to the stated chapter for more information on screens.

Step	Description	Refer to chapter
1.	Refer to "8.5.1 Accessing MANAGE Codes" to access **MANAGE Codes**.	
2.	**NEW (F2)** to access **MANAGE New Code**.	
3.	**MANAGE New Code** **<Code:>** A unique name for the new code. The name may be up to 16 characters long and may include spaces. Input required. **<Code Desc:>** A detailed description of the code. Input optional. **<Group:>** The code group to which the code is to be assigned. All code groups from **MANAGE Code Groups** can be selected. **<Code Type:>** This field contains a choicelist, where the code type (Thematical code - Point, Line, Area or Free code - Free) can be selected. The selected option will define how the code will be used. Selecting a code type allows a code to remain unique. **<Code:>** can have the same value but with a different **<Code Type:>** within the same codelist.	
	<Linework:> Available for **<Code Type: Point>** only. This field contains a choicelist, to allow a new line or new area to be opened whenever the point code is newly selected. This functionality is also available when creating codelists with Stonex® Tools Codelist Management.	

Step	Description	Refer to chapter
	• None: Select this option to disable the functionality. All other code settings on the instrument are not affected when this option is set. • Begin Line: When a point code is newly selected, a new line is opened and the point being stored is added to the line. When the same point code remains selected, a new line is not opened. The point being stored is simply added to the current line. • Begin Area: The behaviour for opening a new area is the same as the behaviour for opening a new line, as mentioned above.	
	<Line Style:> Not available for **<Code Type: Free>**. The style in which lines and areas are represented in MapView and Stonex® Tools.	8.1
4.	**NEW-A (F2)** adds **<Attribute 1:>** as new input field for an attribute of attribute type normal and of value type text.	
☞	**NAME (F3)** or **VALUE (F3)** Available for attributes for which an attribute name can be typed in. To highlight **<Attribute 1:>** or the field for the attribute value. The name of **<Attribute 1:>** can be edited and the attribute value to be used as the default attribute value can be typed in.	
☞	Attributes of attribute type mandatory or fixed and of value type real or integer must be created in Stonex® Tools.	
☞	Up to twenty attributes can be created.	
5.	Is another attribute to be created? • If **yes**, repeat step 4. • If **no**, continue with step 6.	

Step	Description	Refer to chapter
6.	**STORE (F1)** adds the new code and any associated attributes to the System RAM codelist and returns to the screen from where this screen was accessed.	
	A new code can also be created within an application program. In this case, the new code is added to the job codelist.	

8.5.3 Editing a Code

Access step-by-step

Step	Description
1.	Refer to "8.5.1 Accessing MANAGE Codes" to access **MANAGE Codes**.
2.	**EDIT (F3)** to access **MANAGE Edit Code**.
3.	All following steps are identical with the creation of a new code. Refer to "8.5.2 Creating a New Code". Follow the instructions in paragraph "Create a new code step-by-step" from step 3. onwards.
	Attribute names that have already been typed in cannot be edited in a job codelist.

8.6 Managing Code Groups

Access step-by-step

Step	Description
1.	Refer to "8.5.1 Accessing MANAGE Codes" to access **MANAGE Codes**.
2.	**SHIFT GROUP (F4)** to access **MANAGE Code Groups**.

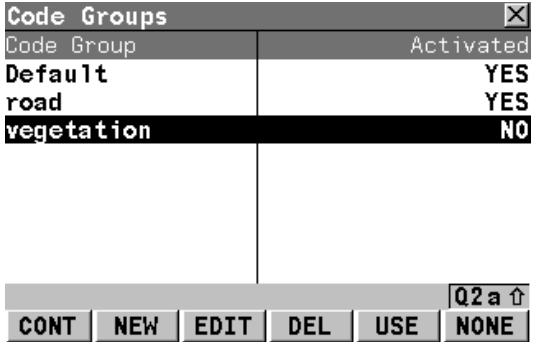
MANAGE Code Groups

The listed code groups belong to

the selected System RAM codelist when this screen was accessed through **Main Menu: Manage...\Codelists**.

OR

to the job codelist when **MANAGE Codes** was accessed from an application program, **MANAGE New Job** or **MANAGE Edit Job**.



CONT (F1)
To close the screen and return to the screen from where this screen was accessed.

NEW (F2)
To create a new code group.

EDIT (F3)
Available for System RAM codelists. To edit the highlighted code group.

DEL (F4)
Available for System RAM codelists. To delete the highlighted code group.

USE (F5)
To activate and deactivate the highlighted code group. Codes belonging to a deactivated code group are not displayed in **MANAGE Codes**.

NONE (F6) or **ALL (F6)**
To deactivate or activate all code groups.

Description of columns

Column	Description
Code Group	The name of the code group.
Activated	Use code group or not. The options are **Yes** and **No**. The codes belonging to a deactivated code group cannot be selected from the choicelist for code selection. **USE (F5)** changes between the options.

Next step

IF a code group	THEN
is to be created	**NEW (F2)**. In **MANAGE New Code Group** type in a unique name for **<Group:>**. **STORE (F1)** stores the new code group typed in and returns to **MANAGE Code Groups**.
is to be edited	highlight the code group and **EDIT (F3)**. In **MANAGE Edit Code Group** type in the changes for **<Group:>**. **STORE (F1)** stores the changes and returns to **MANAGE Code Groups**.

9 Coding

9.1 Overview

Description

A code is a description which can be stored with a point, line, area or alone.
Coding on R9 is very flexible with thematical, free and quick coding being available. Thematical and free coding is possible by selecting codes from a codelist or by directly typing in codes. SmartCodes are a quick way for a code to be stored with a point to be selected and to be measured.

For coding, points, lines and areas have the same behaviour. In this chapter, the word object is used as a generic term for points, lines and areas.

Coding methods

Coding method	Characteristic	Description
Thematical	Use	To store a description together with an object inside an application program or in **Main Menu: Manage...\Data**.
	Selection of the codes	• For thematical coding with codelist: On a configured display mask, codes are selected from the job codelist in a choicelist. The job codelist must contain thematical codes. • For thematical coding without codelist: On a configured display mask, codes are typed in.
	Recording of the codes	Together with the objects.

Coding method	Characteristic	Description
Free	Use	To store a description independent of an object at any time. A free code can be used to store a description related to an object or to store additional descriptions such as the job name or the temperature.
	Selection of the codes	• For free coding using a codelist: Pressing the configured hot key opens a choicelist with the free codes of the job codelist. • For free coding with direct input: Pressing the configured hot key opens a screen for alphanumeric input.
	Recording of the codes	Stored as time related information. A time stamp is stored with each free code. According to the requirements of the CAD package used, free codes can be configured to be stored before or after the object.
Quick	Use	Quick coding is the storing of an object plus a thematical or free code using a minimum number of keystrokes.
	Selection of the codes	Shortcuts must be assigned to codes in the job codelist. **<Quick Code: On>** must be set in **CONFIGURE Coding & Linework**. Typing the shortcut searches for the assigned code and initiates a measurement.
	Recording of the codes	• For thematical codes: Together with the objects.

Coding method	Characteristic	Description
		• For free codes: Stored as time related information before or after the points. A time stamp is stored with each free code.
		Quick codes must be created in Stonex® Tools.
		Characters that can be assigned to quick codes are: • 0 to 9 • A to Z, not case sensitive • a to z, not case sensitive

Configure Coding

Refer to "15.3 Coding & Linework Settings" for information on configuring coding.

9.2 Thematical Coding

9.2.1 Thematical Coding with Codelist

Thematical coding of points with a codelist is explained in this chapter. Refer to "7.4 Line/Area Management" for information on coding lines/areas.

Requirements

- The job codelist contains thematical codes.
- **<Thematc Codes: With Codelist>** in **CONFIGURE Coding & Linework**.
- A display mask with an input field for point codes must be configured.

Access

Open the choicelist for **<Code:>** in a display mask of an application program.

OR

Open the choicelist for **<Code:>/<Point Code:>** in **MANAGE New Point**, **Code** page in data management.

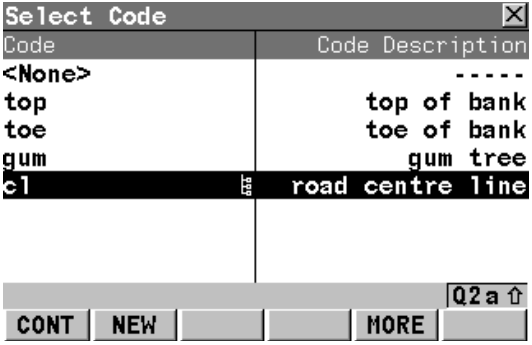
OR

Open the choicelist for **<Point Code:>** in **MANAGE Edit Point: Point ID**, **Code** page in data management.

OR

Open the choicelist for **<Auto Pt Code:>** in **SURVEY Survey: Job Name**, **Auto** page, if configured.

MANAGE
Select Code



CONT (F1)
To return to the screen from where this screen was accessed.

NEW (F2)
To create a new code. Refer to "8.5.2 Creating a New Code".

ATRIB (F3)
Available unless accessed from **MANAGE New Point/Line/Area** or **MANAGE Edit Point/Line/Area**. To type in attribute values for the selected code and/or add new attributes for the selected code.

LAST (F4)
Available if a code has been previously used in the active job. To select from a list of last used codes. The codes are sorted by time with the most recently used code at the top of the list.

MORE (F5)
To display information about the code description, the code group, the code type and the quick code if codes with quick codes exist in the job.

SHIFT GROUP (F4)
To view, create, delete, activate and deactivate code groups. Refer to "8.6 Managing Code Groups".

SHIFT SORT (F5)
To sort codes by code name, code description, quick code or the last used.

Thematical coding with codelist step-by-step

The following table explains the most common settings. Refer to the stated chapter for more information on screens.

Step	Description	Refer to chapter
1.	Refer to paragraph "Access" to access **XX Select Point Code**.	
2.	**MANAGE Select Point Code** All point codes from the job codelist which belong to the active code groups are available for selection. Point codes marked with ⊟ have attributes attached.	8.6
3.	Highlight the desired code.	
4.	**ATRIB (F3)** to access **XX Enter Attributes**.	
5.	**XX Enter Attributes** **<Point Code:>** The name of the selected code for which attribute values are to be typed in. **<Code Desc:>** The detailed description of the selected code. If configured for the selected code, input fields for attribute values are available. Type in the attribute values. Attribute values for attributes of type • normal can be typed in. • fixed cannot be edited.	
☞	**NEW-A (F2)** to add a new attribute of type normal and of value type text.	

Step	Description	Refer to chapter
☞	**NAME (F3)** or **VALUE (F3)** Available for attributes for which an attribute name can be typed in. To highlight **<Attribute n:>** or the field for the attribute value.	
☞	Attributes of type mandatory or fixed and of value type real or integer must be created in Stonex® Tools.	online help in Stonex® Tools.
☞	Up to twenty attributes can be added.	
☞	**LAST (F4)** recalls the last used attribute values for the selected code.	
☞	**DEFLT (F5)** recalls the default attribute values for the selected code.	
6.	**CONT (F1)** returns to the screen from where **XX Select Point Code** was accessed.	
☞	The point code and any associated attribute values are stored when the point is stored.	
☞	If a point with the same point ID exists in the job, the codes, the attribute names and the attribute values of the new and the existing point must be identical. Should they not be identical, a screen opens where the code or attribute mismatch can be corrected.	9.6

9.2.2 Thematical Coding without Codelist

Thematical coding without codelist for points is explained in this chapter. Refer to "7.4 Line/Area Management" for information on coding lines/areas.

Requirements

- **<Thematc Codes: Without Codelist>** in **CONFIGURE Coding & Linework**.
- A display mask with an input field for point codes must be configured.

Access

A thematical code is typed in the field

<Code:> in a display mask of an application program.

OR

<Code:>/<Point Code:> in **MANAGE New Point**, **Code** page in data management. The procedure is similar for lines and areas.

OR

<Point Code:> in **MANAGE Edit Point: Point ID**, **Code** page in data management. The procedure is similar for lines and areas.

OR

in the field **<Auto Pt Code:>** in **SURVEY Survey: Job Name**, **Auto** page, if configured.

Thematical coding without codelist step-by-step

Step	Description
☞	Thematical coding in the Survey application program is explained in this step-by-step instruction. A typical configuration set with a display mask for coding called **Code** is used.
1.	**SURVEY Survey: Job Name**, **Code** page **<Point ID:>** The identifier for the point for which codes and attribute values are to be typed in. **<Point Code:>** The name for the code. **<Attribute n:>** The attribute values for the code. Type in a code and attribute values.
☞	Up to eight attributes can be added. This is configured in the display mask.
2.	**ALL (F1)** to measure angles and distance. OR **PAGE (F6)** to change to another page on this screen.

9.3 Free Coding

9.3.1 Free Coding Using a Codelist

In this chapter, free coding using a codelist is explained for points. Refer to "7.4 Line/Area Management" for information on coding lines/areas.

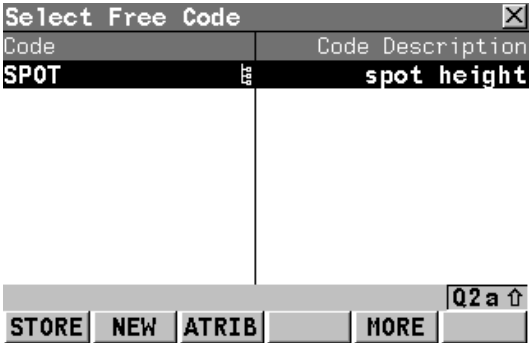
Requirements

- The job codelist contains free codes.
- The user defined menu is configured to display the option **Select Free Code**.

Access

Press **USER** and select **Select Free Code** to access the screen **FREECODE Select Free Code**. Refer to "2 USER Key" for information on the **USER** key.

FREECODE Select Free Code



STORE (F1)
To store the free code and any associated attribute values and to return to the screen from where this screen was accessed.

NEW (F2)
To create a new code. Refer to "8.5.2 Creating a New Code".

ATRIB (F3)
To type in attribute values and/or add new attributes for the selected free code.

LAST (F4)
Available if a free code has been previously used in the active job. To select from a list of last used free codes. The free codes are sorted by time with the most recently used code at the top of the list.

MORE (F5)
To display information about the code description, the code group and the quick code if codes with quick codes exist in the job.

SHIFT GROUP (F4)
To view, create, delete, activate and deactivate code groups. Refer to "8.6 Managing Code Groups".

SHIFT SORT (F5)
To sort codes by code name, code description, quick code or the last used.

Free coding using a codelist step-by-step

The following table explains the most common settings. Refer to the stated chapter for more information on screens.

Step	Description	Refer to chapter
1.	Refer to paragraph "Access" to access **FREECODE Select Free Code**.	9.3
2.	**FREECODE Select Free Code** All free codes from the job codelist which belong to the active code groups are available for selection. Free codes marked with ⁞ have attributes attached.	8.6

Step	Description	Refer to chapter
3.	Highlight the desired code.	
4.	**ATRIB (F3)** to access **FREECODE Enter Attributes**.	
5.	**FREECODE Enter Attributes** **<Free Code:>** The name of the selected code for which attribute values are to be typed in. **<Code Desc:>** The detailed description of the selected code. If configured for the selected code, input fields for attribute values are available. Type in the attribute values. Attribute values for attributes of type • normal can be typed in. • fixed cannot be edited.	
☞	**NEW-A (F2)** to add a new attribute of type normal and of value type text.	
☞	**NAME (F3)** or **VALUE (F3)** Available for attributes for which an attribute name can be typed in. To highlight **<Attribute n:>** or the field for the attribute value.	
☞	Attributes of type mandatory or fixed and of value type real or integer must be created in Stonex® Tools.	online help in Stonex® Tools.
☞	Up to twenty attributes can be added.	
☞	**LAST (F4)** recalls the last used attribute values for the selected code.	
☞	**DEFLT (F5)** recalls the default attribute values for the selected code.	

Step	Description	Refer to chapter
6.	**FREECODE Enter Attributes** **STORE (F1)** returns to the screen from where **FREECODE Select Free Code** was accessed and stores the free code, any associated attribute values and time related information.	

9.3.2 Free Coding with Direct Input

In this chapter, free coding with direct input is explained for points. Refer to "7.4 Line/Area Management" for information on coding lines/areas.

Requirements

The user defined menu is configured to display the option **Enter Free Code**.

Access

Press **USER** and select **Enter Free Code** to access the screen **FREECODE Enter Free Code & Attributes**. Refer to "2 USER Key" for information on the **USER** key.

Free coding with direct input step-by-step

Step	Description
1.	Refer to paragraph "Access" to access **FREECODE Enter Free Code & Attributes**.
2.	**FREECODE Enter Free Code & Attributes** **<Free Code:>** The name for the free code. **<Attribute n:>** The attribute values for the free code. Type in a code and attribute values.
	As soon as a free code is typed in, a codelist is created within the job.
	Up to eight attributes can be added.
	LAST (F4) Available if a free code has been previously used in the active job. Accesses **FREECODE Last Used Free Codes**. To select from a list of last used free codes. The free codes are sorted by time with the most recently used code at the top of the list. In **FREECODE Last Used Free Codes** press **ATRIB (F3)** to type in attribute values.
3.	**STORE (F1)** stores the free code, any associated attribute values and time related information.

9.4 Quick Coding

Requirements

- The job codelist contains quick codes for points, lines and/or areas.
- According to the requirements of the used CAD package, set **<Rec Free Code: Before Point>** or **<Rec Free Code: After Point>** in **CONFIGURE Coding & Linework**.

Activate quick coding

The current setting for **<Quick Code:>** in **CONFIGURE Coding & Linework** determines how quick coding is activated. Quick coding can be activated at any time.

- For **<Quick Code: On>** in **CONFIGURE Coding & Linework**
  Quick coding is active and can be used.
- For **<Quick Code: Off>** in **CONFIGURE Coding & Linework**
  Press **USER**. Refer to "2 USER Key" for information on the **USER** key.
  OR
  Tap the quick coding icon visible during Survey and other application programs where it is possible to measure a point with quick codes.
  OR
  Access **CONFIGURE Coding & Linework** and change the setting. Refer to "15.3 Coding & Linework Settings".
- For **<Quick Code: Never>** in **CONFIGURE Coding & Linework**
  Access **CONFIGURE Coding Settings** and change the setting. Refer to "15.3 Coding & Linework Settings".

Quick coding for points step-by-step

The following table explains the most common settings. Refer to the stated chapter for more information on screens.

Step	Description	Refer to chapter
1.	Refer to paragraph "Activate quick coding" to activate quick coding.	
	A screen must be active where points can be measured. **ALL (F1)** must be visible. For example **SURVEY Survey: Job Name.**	
2.	Type in the one, two or three digits of the quick code. The current setting for **<Digits:>** in **CONFIGURE Coding & Linework** determines by how many keystrokes quick coding is executed.	15.3
	ENTER to execute quick coding already after one or two keystrokes. Available for **<Digits: 2>** and **<Digits: 3>** in **CONFIGURE Coding & Linework**.	
	ESC clears digits from the entry.	
3.	What is the code type of the quick codes? • For point codes continue with the next row. • For free codes continue with step 5.	
	The point code assigned to the quick code is searched for in the job codelist and initiates measurements.	
	Attribute values for attributes of type • normal cannot be typed in. Depending on the setting for **<Attributes:>** in **CONFIGURE Coding & Linework**, the default or the last used attribute values are stored. • fixed cannot be edited.	

Step	Description	Refer to chapter
☞	The point code and any associated attribute values are stored with the point.	
☞	If a point with the same point ID exists in the job, the codes, the attribute names and the attribute values of the new and the existing point must be identical. Should they not be identical, a screen opens where the code or attribute mismatch can be corrected.	9.6
4.	Quick coding for a point code is finished.	
5.	Quick coding for free codes continues from here.	
☞	The free code assigned to the quick code is searched for in the job codelist and initiates measurements.	
☞	Attribute values for attributes of type • normal cannot be typed in. Depending on the setting for **<Attributes:>** in **CONFIGURE Coding Settings**, the default or the last used attribute values are stored. • fixed cannot be edited.	
☞	The free code, associated attribute values and time related information are stored. The setting for **<Rec Free Code:>** in **CONFIGURE Coding & Linework** determines if the free code is stored before or after the point.	
6.	Quick coding for a free code is finished.	

Quick coding for lines/areas step-by-step

The following table explains the most common settings. Refer to the stated chapter for more information on screens.

Step	Description	Refer to chapter
1.	Refer to paragraph "Activate quick coding" to activate quick coding.	
2.	Type in the one, two or three digits of the quick code. The current setting for **<Digits:>** in **CONFIGURE Coding & Linework** determines by how many keystrokes quick coding is executed.	15.3
☞	**ENTER** to execute quick coding already after one or two keystrokes. Available for **<Digits: 2>** and **<Digits: 3>** in **CONFIGURE Coding & Linework**.	
☞	**ESC** clears digits from the entry.	
☞	The line/area code assigned to the quick code is searched for in the job codelist.	
☞	A new line/area is created and immediately stored with that line/area code and attributes. For the line/area ID, the line/area ID template as defined in **CONFIGURE ID Templates** is used.	
☞	The system asks for mandatory attribute values.	
3.	Quick coding for a line/area is finished.	

9.5 SmartCodes

9.5.1 Overview

Description	SmartCodes is basically a quick way for code to be selected and point to be measured. All existing coding, linework, and point measurement functionality is retained.

9.5.2 Configuring SmartCodes

Access

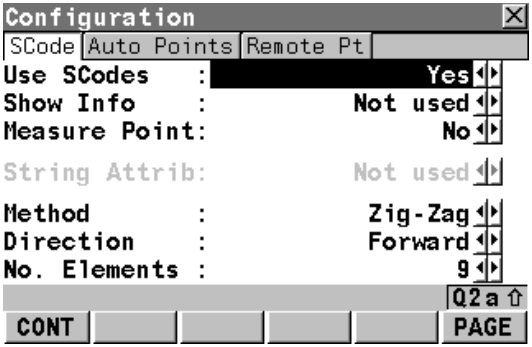
Select **Main Menu: Survey**. In **SURVEY Survey Begin** press **CONF (F2)** to access **SURVEY Configuration**.

OR

In **SURVEY Survey**: **Job Name** press **SHIFT CONF (F2)** to access **SURVEY Configuration**.

SURVEY Configuration, SCode page

The settings on this page activate the using of SmartCodes and define the method. All settings in this panel are stored within the currently active configuration set.



CONT (F1)
To accept changes and return to the screen from where this screen was accessed.

PAGE (F6)
To change to another page on this screen.

Description of fields

Field	Option	Description
<Use SCodes:>	**Yes**	Activates using of SmartCodes. All other fields on the screen are active and can be edited.

Field	Option	Description
	No	Deactivates using of SmartCodes and all fields on this screen.
<Show Info:>		Information shown in line 8 of **SURVEY Survey: Job name, SCode** page.
	Not used	No display mask element is shown.
	Point ID	The identifier for the measured points. The configured point ID template is used. ☞ Refer to "35.2 Surveying Points".
	3D CQ	The current 3D coordinate quality of the measured point.
	2D CQ	The current 2D coordinate quality of the measured point.
	1D CQ	The current height coordinate quality of the measured point.
	Reflector Ht	The height of the reflector that is being used. Changing the reflector height here does not update the default reflector height as defined in the active configuration set.
	Hz	The current horizontal angle of the measured point.
	V	The current vertical angle of the measured point.
	Horiz Dist	The current horizontal distance of the measured point.
	Slope Dist	The current slope distance of the measured point.

Field	Option	Description
	Ht Diff	The current height difference between the station and the measured point.
	Linework	The linework flag to be stored with the point. The options available depend on whether a line/area is currently open. Refer to "10.2 Performing Linework" for an explanation of the options that become available in **SURVEY Survey: Job name, SCode** page.
<Measure Point:>	**Yes** or **No**	If one of the code boxes is tapped in **SURVEY Survey**: **Job name**, **SCode** page then that code is selected and the point is measured for **<Measure Point:Yes>**.
<String Attrib:>	Choicelist	Available for **<Show Codes: All Codes>**. When this field is active, surveyed points that have the same code attached are strung to one line. ☞ Refer to "15.3 Coding & Linework Settings".
<Method:>		Method by which subsequent code box is selected after a point is stored.
	Not used	**<Direction:>** and **<No. Elements:>** are invisible and the number of codes boxes shown in **SURVEY Survey: Job name, SCode** page is nine.
	Zig-Zag	Each new code block is started at the same end as where the previous code block finished.
	Same direc-tion	Each new code block is started at the same end as where the previous code block started.

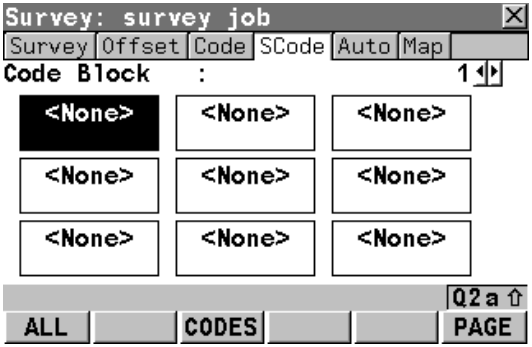
Field	Option	Description
<Direction:>		The way of using the code boxes. This influences in which order the code boxes will be applied.
	Forward	The code boxes are used in the same way as defined in **SURVEY Survey: Job name, SCode** page.
	Backward	The code boxes are used in the reverse way as defined in **SURVEY Survey: Job name, SCode** page.
<No. Elements:>	**1, 2, 3, 4, 5, 6, 7, 8 or 9**	Number of code boxes shown in **SURVEY Survey: Job name, SCode** page.

9.5.3 Code Block

Requirements

- **<Use SCodes: Yes>** in **SURVEY Configuration**, **SCode** page.

SURVEY
Survey: Job Name, SCode page



ALL (F1)
To measure and store distances and angles.

CODES (F3)
To select a code from **MANAGE Select Code** panel.

PAGE (F6)
To change to another page on this screen.

SHIFT CONF (F2)
To activate/deactivate/configure SmartCodes.

SHIFT 2FACE (F4)
To take a measurement in Face I and Face II. The point stored is an average of the two measurements.

Creating a Code Block step-by-step

The following table explains the most common settings. Refer to the stated chapter for more information on screens.

Step	Description	Refer to chapter
1.	Refer to paragraph "Accessing Survey" to access **SURVEY Survey Begin**.	35.1
2.	**CONT (F1)** to access **SURVEY Survey: Job Name**.	
3.	**PAGE (F6)** until the **SCode** page is visible.	

Step	Description	Refer to chapter
4.	With the focus on **<Code Block: 1>** press enter to access **SURVEY Manage Code Blocks** panel.	
5.	**NEW (F2)** to create a new code block.	
☞	Code blocks can only be created or deleted in **SURVEY Manage Code Blocks** panel.	
6.	**CONT (F1)** to return to **SURVEY Survey: Job Name, SCode** page.	

Assigning codes to a Code Block step-by-step

The following table explains the most common settings. Refer to the stated chapter for more information on screens.

Step	Description	Refer to chapter
1.	Refer to paragraph "Creating a Code Block step-by-step" to access **SURVEY Survey: Job Name, SCode** page.	
2.	Move the focus on a code box.	
3.	**CODES (F4)** to select a code to be assigned to the highlighted code block.	
☞	To create a new code to be assigned refer to "Creating a New Code".	8.5.2

Copying a Code Block to a new job step-by-step

The following table explains the most common settings. Refer to the stated chapter for more information on screens.

Step	Description	Refer to chapter
☞	Code blocks are stored in the job.	
1.	Refer to paragraph "Accessing Job Management" to access **MANAGE Edit Job: Job Name, Codelist** page.	6.2
☞	**<Codelist:>** If codes had been copied from a System RAM codelist, the name of the codelist is displayed. If codes have been typed in, then the name of the active job is displayed.	
2.	**SHIFT EXPRT (F2)** copies codes and code blocks from the job to an existing or new codelist.	
☞	To create a new codelist refer to "Creating/Editing a Codelist".	8.4
☞	Copying code blocks to an existing codelist overwrites the code blocks of the existing codelist.	
3.	**STORE (F1)** to save the currently active job and return to **MANAGE Job (Device)**.	
4.	Create a new job and assign the related codelist to the job.	
☞	SmartCodes from the codelist are now available within the new job.	
☞	To create a new job refer to "Creating a New Job".	6.3

9.5.4 Using SmartCodes

Measuring points using Code Blocks step-by-step

The following table explains the most common settings. Refer to the stated chapter for more information on screens.

Step	Description	Refer to chapter
1.	Refer to paragraph "Creating a Code Block step-by-step" to access **SURVEY Survey: Job Name, SCode** page.	9.5.4
2.	Move the focus on a code box.	
☞	When **<String Attrib:>** is active, you can type in an attribute value below the code name of the highlighted code box.	
☞	**+ (F4)** or **- (F5)** to increase or decrease the value. Applies only if the value is numeric.	
3.	**ALL (F1)** to measure and store the point with the highlighted code.	
☞	When **<Measure Point: Yes>** is set in the configuration settings, tapping the code box with the supplied stylus automatically measures and stores the point with the highlighted code. Selecting the code box by using the arrow keys will not measure and store the point.	

Measuring lines/ares using Code Blocks step-by-step

The following table explains the most common settings. Refer to the stated chapter for more information on screens.

Step	Description	Refer to chapter
1.	Activate **<Show Info: Linework>** in **SURVEY Configuration**, **SCode** page.	9.5.2
2.	Refer to paragraph "Creating a Code Block step-by-step" to access **SURVEY Survey: Job Name, SCode** page.	9.5.4
3.	Create a line/area SmartCode and return to **SURVEY Survey: Job Name, SCode** page.	9.5.3
☞	The line/area is opened and closed using the SmartCode.	
4.	To start an arc/spline move the focus on **<Linework:>**, the last line of the page, and select the linework flag to be stored with the point.	
5.	Move the focus on the line/area code box.	
6.	**ALL (F1)** to measure and store the point with the highlighted line/area code.	

9.6 Code and Attribute Mismatch

9.6.1 Code Mismatch

Description

When storing a point with a code, it may happen that a point with the same point ID already exists in the job. If the codes of the new and the existing point do not match, a screen opens where the code can be corrected. One point cannot have different codes.

XX
Point Code Mismatch

STORE (F1)
To store the highlighted code and any associated attributes with the point being stored and to continue with the application program or data management.

MORE (F5)
To display information about the code description, the code group and any attributes associated with the highlighted code.

Description of fields

Field	Option	Description
<New Code:>	Output	The code for the point.
<Stored Code:>	Output	The code as stored for the existing point in the job.

Match codes step-by-step

Step	Description
☞	**XX Point Code Mismatch** opens automatically if the codes of the new and the existing point do not match.
1.	Highlight the code to be stored with the new point.
2.	**STORE (F1)** stores the highlighted code and any associated attributes with the point being stored and continues with the application program or data management.

9.6.2 Attribute Mismatch

Description

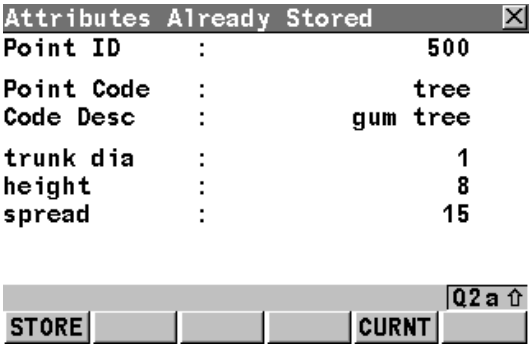
If a point with the same point ID exists in the job, the codes, the attribute names and the attribute values of the new and the existing point must be identical. Should they not be identical, a screen opens where the attribute mismatch can be corrected. One point cannot have different attributes.

The name of the screen changes with pressing **CURNT (F5)** or **STORD (F5)**:

Pressing **CURNT (F5)**: **XX Attributes Being Stored**
Pressing **STORD (F5)**: **XX Attributes Already Stored**

For simplicity, the screen shown is **XX Attributes Already Stored**.

XX Attributes Already Stored



STORE (F1)
To store the selected attributes with the new/created point and to continue with the application program or data management.

CURNT (F5) or **STORD (F5)**
To change between viewing the attribute names and values of the new/created point and those stored for the existing point in the job.

Description of fields

Field	Option	Description
<Point Code:>	Output	• For **XX Attributes Already Stored**: The code of the existing point in the job. • For **XX Attributes Being Stored**: The code of the new point.
Attributes	Output	• For **XX Attributes Already Stored**: The attributes as stored for the existing point in the job. • For **XX Attributes Being Stored**: The attributes of the new point.

Match attributes step-by-step

Step	Description
	XX Attributes Already Stored opens automatically if the attribute names and/or values of the new and the existing point do not match.
1.	**CURNT (F5)** and **STORD (F5)** to display the attribute names and values to be stored with the point.
2.	**STORE (F1)** stores the displayed attribute names and values with the point being stored and continues with the application program or data management.

10 Linework

10.1 Overview

Description

Two methods are available for the surveying of lines and areas. These two methods can be combined and are described in the following table.

Linework by	Description

Linework	• In all application programs, a display mask can be configured to show the field **<Linework:>.** This field contains a choicelist, where the Linework flags can be selected.
	• The selection of a linework flag determines:
	  • the action taken for a line/area, for example beginning a line.
	  • the linework flag to be stored with the point.
	• The Linework flags:
	  • are configured in **CONFIGURE Coding & Linework**, **Linework**.
	  • can be exported with a format file.

Coding	• Line/area codes can be selected in many application programs. • Refer to "8.5.2 Creating a New Code" and "9 Coding" for more information.

- The Linework flag and coding are not linked.
- Additionally to Linework, thematical point, line and area codes can be used.
- Quick coding can be used as per normal.

10.2 Performing Linework

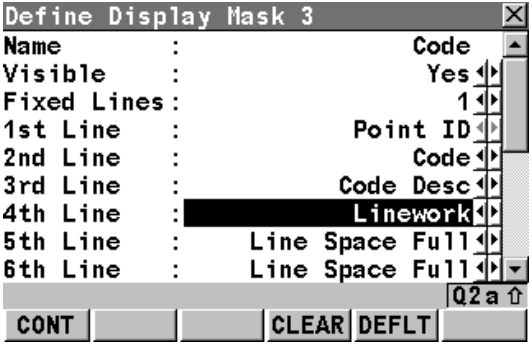
The Survey application program is used here to explain Linework.

Requirements

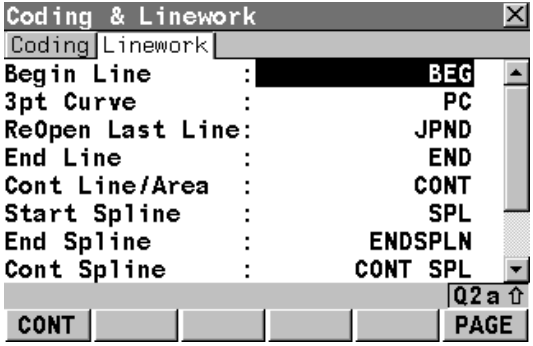
- A display mask with a choicelist for Linework must be configured.
- The Linework flags are defined in **CONFIGURE Coding & Linework Settings**, **Linework**

Preparing Linework

Step1: Placing Linework in a display mask



Step2: Defining the Linework flags



Performing Linework

The most important keys are explained.

ALL (F1)
To measure and store distances and angles.

STOP (F1)
Available if **<EDM Mode: Tracking>** and **DIST (F2)** was pressed. Stops the distance measurements. **(F1)** changes back to **ALL**.

DIST (F2)
To measure and display distances. Available unless **<EDM Mode: Tracking>** and/or **<Log Auto Pts: Yes>**, after the tracking or logging is started.

REC (F3)
To record data. If **<EDM Mode: Tracking>** and/or **<Log Auto Pts: Yes>**, records measured point and continues tracking.

Description of fields

Field	Option	Description
<Point ID:>	User input	The identifier for manually occupied points. The configured point ID template is used. The ID can be changed in the following ways: • To start a new sequence of point ID's type over the point ID.

Field	Option	Description
		• For an individual point ID independent of the ID template **SHIFT INDIV (F5)**. **SHIFT RUN (F5)** changes back to the next ID from the configured ID template. Refer to "15.1 ID Templates".
<Linework:>		The linework flag to be stored with the point. The options available depend on whether a line/area is currently open.
	- - - - -	No linework flag is stored.
	Begin Line	Opens a new line when the next point is stored. Any line/area which is currently open is closed and the last point belonging to that line/area is given the **End Line**/**Close Area** linework flag. The point may or may not be stored with a point code.
	3pt Curve	Stores the linework flag for a curve through the next three measured points and continues a line/area.
	ReOpen Any Line	Opens a line from a list of all lines which are currently stored in the job when the next point is stored. The last code used with the reopened line is automatically selected when the point is stored. Any line/area which is currently open is closed and the last point belonging to that line/area is given the **End Line**/**Close Area** linework flag.

Field	Option	Description
	ReOpen Last Line	Opens the last used line again. The last code used with the reopened line is automatically selected when the point is stored.
	End Line	Closes all open lines.
	Cont Line/Area	Indicates a line/area is open.
	Start Spline	Stores the linework flag for beginning a spline and continues any open line/area.
	End Spline	Closes a spline and continues any open line/area.
	Cont Spline	Indicates a line/area is open with spline line type.
	Begin Area	Opens a new area when the next point is stored. Any line/area which is currently open is closed and the last point belonging to that line/area is given the **End Line/Close Area** linework flag. The point may or may not be stored with a point code.
	ReOpen Any Area	Opens an area from a list of all lines which are currently stored in the job when the next point is stored. The last code used with the reopened area is automatically selected when the point is stored. Any line/area which is currently open is closed and the last point belonging to that line/area is given the **End Line/Close Area** linework flag.
	ReOpen Last Area	Opens the last used area again. The last code used with the reopened area is automatically selected when the point is stored.

Field	Option	Description
	Close Area	Closes all open areas.

Next step

Step	Description
1.	Go to the point to be measured.
2.	Select the appropriate Linework flag to be stored with the next point.
3.	**ALL (F1)**
4.	Repeat steps 1. to 3. until all points are measured and stored.
5.	**SHIFT QUIT (F6)** to exit the Survey application program.
6.	Use a format file to export the points including the linework flags.

Selecting a line with MapView

- Selecting a line in MapView is possible with either the softkeys or the touch screen.
- Refer to "30 MapView Interactive Display Feature" for further information.

10.3 Combining Linework and Coding

Description

- Linework and coding can be combined.
- This combination can be useful, because coding, assigning linework flags and opening/closing lines/areas can all be done with one point observation.
- Combining Linework and coding can only be configured if thematical point codes or if thematical point, line and area codes are available for selection. Thematical coding can be done with or without codelists.

Linework and coding can also be combined using SmartCodes. Refer to "9.5.4 Using Smart-Codes".

Configuration options

- The configuration for the types of codes available and the configuration for coding with/without a codelist both have an influence on the following:
  - The required configuration of a display mask.
  - The behaviour of the fields configured for the display mask.
  - The behaviour of the software.
- The possible configurations and their influence are shown in this table:

Configuration in **CONFIGURE Coding & Linework**				
Show Codes	Only Pt Codes		All Codes	
Thematc Codes	With Codelist	Without Codelist	With Codelist	Without Codelist
Required fields and their appearance in display mask				
Code				
Required	✓	✓	✓	✓

Optional	-	-	-	-
Appearance	Choicelist	User input	Choicelist	User input
Code Type				
Required	-	-	-	✓
Optional	✓	✓	✓	-
Appearance	Output	Output	Output	Choicelist
Linework				
Required	✓	✓	✓	✓
Optional	-	-	-	-
Appearance	Choicelist	Choicelist	Choicelist	Choicelist

Requirements

- A display mask must be configured with:
  - a field for codes.
  - a choicelist for Linework.

- The configuration of a field for code types in a display mask is required for working with point, line and area codes without choicelist. Else the configuration of a field for code types is optional.

- Configure in **CONFIGURE Coding & Linework**, **Coding**:
  - **<Show Codes: Only Pt Codes>** or **<Show Codes: All Codes>**.
  - **<Thematc Codes: With Codelist>** or **<Thematc Codes: Without Codelist>**.
- In **CONFIGURE Coding & Linework Settings**, **Linework** defines the flags for Linework.

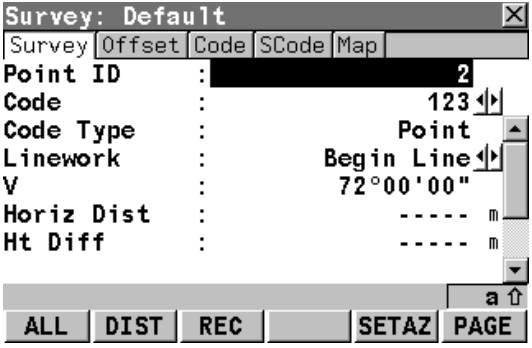
The Survey application program is used here to explain the combination of Linework/Coding.

Access step-by-step

Step	Description
1.	Select **Main Menu: Survey** to access **SURVEY Survey Begin**.
2.	In **SURVEY Survey Begin** select a job.
3.	Select a configuration set.
4.	Select a reflector.
5.	**CONT (F1)** to access **SURVEY Survey: Job Name**.

Using Linework/Coding

This is what a display mask configured for Linework and coding looks like. The most important keys are explained. For the explanation of the other keys refer to "35.2 Surveying Points".



ALL (F1)
To measure and store distances and angles.

STOP (F1)
Available if **<EDM Mode: Tracking>** and **DIST (F2)** was pressed. Stops the distance measurements. **(F1)** changes back to **ALL**.

DIST (F2)
To measure and display distances. Available unless **<EDM Mode: Tracking>** and/or **<Log Auto Pts: Yes>**, after the tracking or logging is started.

REC (F3)
To record data. If **<EDM Mode: Tracking>** and/or **<Log Auto Pts: Yes>**, records measured point and continues tracking.

Using Linework/Coding for point codes step-by-step

For <Show Codes: Only Pt Codes>

Step	Field	Description for thematical coding	
		With codelist	**Without codelist**
1.	**<Code:>**	Select a code from the choicelist. Only point codes are available for selection.	Type in a code.
☞		**<None>** to store a point without code or to perform Linework without coding.	**-----** to store a point without code or to perform Linework without coding.
2.	**<Code Type:>**	• **Point** is displayed. This field is an output field only.	
3.	**<Linework:>**	• Select a Linework flag to be stored with the point.	
☞		• Select **-----** to store a point without a Linework flag or to perform coding without Linework.	
4.	-	• **ALL (F1)**	
☞	-	• The point is stored with the selected code.	
	-	• The point is stored with the selected Linework flag.	
	-	• The choice of flags available for **<Linework:>** is updated.	

Using Linework/Coding for all codes step-by-step

For <Show Codes: All Codes>

Step	Field	Description for thematical coding	
		With codelist	**Without codelist**
1.	**<Code:>**	Select a code from the choicelist. Point, line and area codes are available for selection. **<None>** to store a point without code or to perform Linework without coding.	Type in a code. **-----** to store a point without code or to perform Linework without coding.
2.	**<Code Type:>**	The type of the selected code. This field is an output field only.	Select the type of the entered code.
3.	**<Linework:>**	• Select a Linework flag to be stored with the point. • Select **-----** to store a point without a Linework flag or to perform coding without Linework.	
4.	-	• **ALL (F1)**	
	- - -	• For a point code being selected: • The point is stored with the selected code. • The point is stored with the selected Linework flag. • The choice of flags available for **<Linework:>** is updated.	

11 Manage...\Configuration Sets

11.1 Overview

Description	The instrument has numerous user configurable parameters and functions. This allows a variety of preferences to be addressed. The configuration of the parameters and functions for an individual measuring technique are combined in a configuration set.
Default configuration sets	Default configuration sets exist on the instrument. They use standard settings for the majority of application programs. Default configuration sets can be edited and deleted. It is always possible to restore the default configuration sets.
User defined configuration sets	New configuration sets can be created. The configuration set wizard assists in editing configuration sets.
Edit outside the configuration set wizard	Parameters and functions can be edited without going through the configuration set wizard. Refer to "11.4 Editing a Configuration Set" for more information.
☞	Each application program can be configured separately. Application program settings are configured in the application program but are stored as part of the configuration set. Refer to "31 Application Programs - General".

11.2 Accessing Configuration Set Management

Access

Select **Main Menu: Manage...\Configuration Sets**.

OR

Press **USER**. Refer to "2 USER Key" for information on the **USER** key.

OR

From a choicelist in some screens for example the begin screen of application programs.

MANAGE
Configuration Sets

CONT (F1)
To select the highlighted configuration set and to return to **R9 Main Menu**.

NEW (F2)
To create a new configuration set. Refer to "11.3 Creating a New Configuration Set".

EDIT (F3)
To edit a configuration set. Accesses the first screen of the sequential configuration set wizard for the highlighted configuration set. Default configuration sets can be edited. Refer to "11.4 Editing a Configuration Set".

DEL (F4)
To delete the highlighted configuration set.

MORE (F5)
To display information about the description, the creator and the creation date of the configuration set.

SHIFT SET-D (F4)
Available unless a default configuration set is highlighted. To turn the highlighted configuration sets into a user defined default configuration set stored in the instrument.

SHIFT DEFLT (F5)
To recall previously deleted default configuration sets and to reset default configuration sets to the default settings. User defined configuration sets are not affected.

Next step

IF a configuration set	THEN
is to be selected	select the desired configuration set. **CONT (F1)** to close the screen and to return to the screen from where **MANAGE Configuration Sets** was accessed.
is to be created	highlight any configuration set and **NEW (F2)**. Refer to "11.3 Creating a New Configuration Set".
is to be edited	highlight the configuration set and **EDIT (F3)**. Refer to "11.4 Editing a Configuration Set".

11.3 Creating a New Configuration Set

Access

Refer to "11.2 Accessing Configuration Set Management" to access **MANAGE Configuration Sets**.

Configuration step-by-step

The following table explains the most common settings. Refer to the stated chapter for more information on screens.

Step	Description	Refer to chapter
1.	In **MANAGE Configuration Sets** highlight a configuration set. A copy of this configuration set is taken for further configurations. Example: Select **DEFAULT** for the creation of a new configuration set.	11.2
2.	**NEW (F2)** to access **MANAGE New Configuration Set**. A copy of the highlighted configuration set is created.	
3.	**MANAGE New Configuration Set** **<Name:>** A unique name for the new configuration set. **<Description:>** A detailed description of the configuration set, since the name of a configuration set is usually an abbreviation. Input optional. **<Creator:>** The person's name who creates the new configuration set. Input optional. Enter a name.	
4.	**STORE (F1)** stores the new configuration set with the entered name. Starts the sequential configuration set wizard.	

Step	Description	Refer to chapter
5.	**CONFIGURE Wizard Mode** **<Wizard Mode: Reduced>**	17.2
☞	**LIST (F6)** accesses **CONFIGURE Quick Access**. Lists all screens within the configuration set. Allows to access these individual screens and to change settings.	
6.	**CONT (F1)** to access **CONFIGURE Coding & Linework**.	
7.	**CONFIGURE Coding & Linework**	15.3
8.	**CONT (F1)** to access **CONFIGURE TPS Correction**.	
9.	**CONFIGURE TPS Corrections** Configure atmospheric ppm, geometric ppm and refraction.	16.4
10.	**CONT (F1)** to access **CONFIGURE EDM & iLock Settings**.	
11.	**CONFIGURE EDM & iLock Settings**	16.1
12.	**CONT (F1)** to access **CONFIGURE Offsets**.	
13.	**CONFIGURE Offsets**	15.4
14.	**CONT (F1)** to access **MANAGE Configuration Sets**.	
15.	**MANAGE Configuration Sets** The adapted configuration set is highlighted.	
16.	**CONT (F1)** closes the screen and returns to **R9 Main Menu**. The highlighted configuration set is then the active configuration set.	

11.4 Editing a Configuration Set

Description

There are two possibilities to edit a configuration set.

Using the **configuration set wizard** to be lead through the steps.

OR

Outside of the **configuration set wizard**. Each screen can be accessed separately without being guided through the steps.

Access step-by-step with using configuration set wizard

Step	Description
1.	Refer to "11.2 Accessing Configuration Set Management" to access **MANAGE Configuration Sets**.
2.	In **MANAGE Configuration Sets** highlight a configuration set to be edited.
3.	**EDIT (F3)** to access **CONFIGURE Wizard Mode**. This starts the sequential configuration set wizard.
4.	All following steps are identical with the creation of a new configuration set. Refer to "11.3 Creating a New Configuration Set". Follow the instructions in paragraph "Configuration step-by-step" from step 5. onwards.

Access without using the configuration set wizard

The currently active configuration set can be edited. Choose one of the following options and access the required screens to edit the configuration set.

Select **Main Menu: Config...**. Refer to "5 Main Menu".

OR

From inside an application program press **USER** and then **CONF (F2)**.

OR

In **CONFIGURE Wizard Mode**, press **LIST (F6)**. Refer to "11.3 Creating a New Configuration Set".

12 Manage...\Reflectors

12.1 Overview

Description

- Each reflector type has an additive constant.
- Some reflectors are predefined as default and can be selected.
- Additional reflectors can be defined.

Default reflector

Following default reflectors are always available on the instrument:

Name in list	Type	Additive Constant
360° Prism	Prism	+23.1 mm
Reflectorless	RL	+34.4 mm

Active reflector

One reflector is always the active reflector.

12.2 Accessing Reflector Management

Access

Select **Main Menu: Manage...\Reflectors**.

OR

Press **USER**. Refer to "2 USER Key" for information on the **USER** key.

OR

From a choicelist in some screens for example the **SURVEY Survey Begin** screen.

MANAGE Reflectors

CONT (F1)
To select the highlighted reflector and to return to the previous screen.

NEW (F2)
To define a new reflector. Refer to "12.3 Creating a New Reflector".

EDIT (F3)
To edit the highlighted reflector, except for default reflectors. Refer to "12.4 Editing a Reflector".

DEL (F4)
To delete the highlighted reflector, except for default reflectors.

MORE (F5)
To display information about the additive constant, the reflector type and the creator of the reflector.

Next step

IF a reflector	THEN
is to be selected	highlight the desired reflector. **CONT (F1)** closes the screen and returns to the screen from where **MANAGE Reflectors** was accessed.
is to be created	highlight any reflector and **NEW (F2)** creates a new reflector. Refer to "12.3 Creating a New Reflector".
is to be edited	highlight the desired reflector. **EDIT (F3)** Refer to "12.4 Editing a Reflector".

12.3 Creating a New Reflector

Access

Refer to "12.2 Accessing Reflector Management" to access **MANAGE Reflectors**.

Create new reflector step-by-step

Step	Description
1.	In **MANAGE Reflectors** press
2.	**NEW (F2)** The **<Type:>** of the new reflector is taken from the previously highlighted reflector except for RL reflectors.
3.	**MANAGE New Reflector** **<Name:>** A significant name for the new reflector. **<Type:>** The type of reflector to be defined can be **<Type: Prism>, <Type: Tape>** or **<Type: Undefined>**. **<Add. Constant:>** The additive constant is always in [mm]. ☞ An additive constant of 0.0 mm has been defined for circular standard prisms. All entered or selected additive constant values are differences to this 0.0 mm prism system. ☞ The additive constants of prisms are often given in the true zero prism system. Use the following formula to convert the additive constant to the prism system. This Stonex® constant needs to be entered into the Stonex® instrument. Formula: True zero constant - 34.4 mm = Stonex® constant. It is highly recommended to check the additive constant for non Stonex® prisms on a baseline by means of an appropriate procedure. **<Creator:>** A name of the creator or other comments can be entered.
4.	**STORE (F1)** stores the new reflector and returns to **MANAGE Reflectors**.

12.4 Editing a Reflector

Access

Refer to "12.2 Accessing Reflector Management" to access **MANAGE Reflectors**.

Edit reflector step-by-step

The following table explains the most common settings. Refer to the stated chapter for more information on screens.

Step	Description	Refer to chapter
1.	In **MANAGE Reflectors** highlight a reflector to be edited.	
2.	**EDIT (F3)** to access **MANAGE Edit Reflector**.	
3.	**MANAGE Edit Reflector** The fields are identical with those for the creation of a new reflector. All fields can be edited except fields of Stonex® default reflectors. Make the required changes.	12.3
4.	**STORE (F1)** stores the changes and returns to **MANAGE Reflectors**.	

13 Convert...\Export Data from Job

13.1 Overview

Description

This screen lists all the exporters loaded.

Data can be exported

- to a file on the CompactFlash card.
- via RS232 to an external device. Refer to "19 Config...\Interfaces... - Editing The Interface" for information on how to configure the interface.

Export format

Format	Characteristic	Description
Custom ASCII	Export variables	Refer to the online help of Stonex® Tools.
	Format definition	Composed individually as format file using Stonex® Tools. Refer to the online help of Stonex® Tools for information on creating format files.
	Units	Defined within the format file.
	Height	All height types are supported. If the desired height cannot be computed, the default value for the missing variable is output.
DXF	Export variables	All points are exported in local grid.
	Height	Orthometric height

13.2 Accessing the Data Export Functionality

Access

Select **Main Menu: Convert...\Export Data from Job**.

OR

Press **USER**. Refer to "2 USER Key" for information on the **USER** key.

Next step

IF exporting to	THEN
custom ASCII format	Refer to "13.3 Exporting Data from a Job to a Custom ASCII Format".
another device	Refer to "13.4 Exporting Data from a Job to another Device".
DXF format	Refer to "13.5 Exporting Data in DXF Format".

13.3 Exporting Data from a Job to a Custom ASCII Format

Description

The settings on this screen define the data that is converted and exported and what format is used.

Data is exported from the selected job. Currently active view, filter and sort settings are applied. The points that are exported are those that are visible in **MANAGE Data**: **Job Name**.

Requirement

At least one format file was created using Stonex® Tools and has been transferred to the System RAM.

Access

Refer to "13.2 Accessing the Data Export Functionality" to access **EXPORT Export ASCII from Job**.

Export data step-by-step

The following table explains the most common settings. Refer to the stated chapter for more information on screens.

Step	Description	Refer to chapter
1.	**EXPORT Export ASCII from Job** **<Export To: CF Card>** **<Directory:>** Available for **<Export To: CF Card>**. The data can be exported to the \Data, the \GSI or the root directory. **<Job:>** All jobs from **Main Menu: Manage...\Jobs** can be selected. **<Format File:>** The format files currently available in the System RAM.	6

Step	Description	Refer to chapter
	<File Name:> The name of the file to which the data should be exported. The name is automatically suggested based on the job name to be exported and an extension. The default extension to be used can be configured in the **EXPORT Define ASCII Export** panel using **CONF (F2)**. Select the job to be exported and enter an individual file name or accept the suggested name.	
2.	Highlight **<Format File:>** and **ENTER**.	
3.	**EXPORT Format Files** All format files available in the System RAM are listed. Select the format file to be used.	
☞	**DEL (F4)** deletes the highlighted format file from the System RAM.	
4.	**CONT (F1)** selects the highlighted format file and leads back to **EXPORT Export ASCII from Job**.	
5.	**FILT (F4)** to set the sort and filter settings for export. Accesses **EXPORT Sorts & Filters**.	
6.	**EXPORT Sorts & Filters, Points** page **<Sort:>** The order in which points, lines and areas are exported. **<Filter:>** Defines which points are exported.	7.6
7.	**CONT (F1)** accepts the changes and returns to **EXPORT Export ASCII from Job**.	

Step	Description	Refer to chapter
8.	**CONT (F1)** exports the data.	
9.	Information message: Are more data to be exported? • If **yes**, continue with step 10. • If **no**, continue with step 11.	
10.	**YES (F4)**. Repeat steps 1. to 9.	
11.	**NO (F6)** returns to the **R9 Main Menu**.	

13.4 Exporting Data from a Job to another Device

General

Data can be transferred to an external device via RS232.

Access

Refer to "13.2 Accessing the Data Export Functionality" to access **EXPORT Export ASCII from Job**.

Export data step-by-step

The following table explains the most common settings. Refer to the stated chapter for more information on screens.

Step	Description	Refer to chapter
1.	**EXPORT Export ASCII from Job** **<Export To: RS232>**	13.1
☞	**IFACE (F5)** accesses **CONFIGURE Export Job Interface.** Choose the port and device to which the data should be exported.	
2.	**FILT (F4)** to set the sort and filter settings for the export. Accesses **EXPORT Sorts & Filters**.	
3.	**EXPORT Sorts & Filters, Points** page **<Sort:>** The order in which points, lines and areas are exported. **<Filter:>** Defines which points are exported.	7.6
4.	**CONT (F1)** accepts the changes and returns to **EXPORT Export ASCII from Job**.	
5.	**CONT (F1)** exports the data.	
6.	Information message: Are more data to be exported?	

Step	Description	Refer to chapter
	• If **yes**, continue with step 7. • If **no**, continue with step 8.	
7.	**YES (F4)**. Repeat the steps 1. to 6.	
8.	**NO (F6)** returns to the **R9 Main Menu**.	

13.5 Exporting Data in DXF Format

General

Data can be exported to a DXF file in the \DATA directory of the CompactFlash card.

Access

Refer to "13.2 Accessing the Data Export Functionality" to access **EXPORT Export DXF from Job**.

Export data step-by-step

Step	Description
1.	**EXPORT Export DXF from Job** **<Job:>** All jobs from **Main Menu: Manage...\Jobs** can be selected. **<File name:>** The name of the file to which the data should be exported. The name is automatically suggested based on the job name to be exported and the extension dxf. Select the job to be exported and enter an individual file name or accept the suggested name.
☞	**CONF (F2)** accesses **EXPORT Configuration**, **Export** page. **<Points:>** Defines if points are exported. **<Lines:>** Defines if lines are exported. **<Areas:>** Defines if areas are exported. **<Filter:>** Defines which points are exported.
☞	**PAGE (F6)** changes to the **DXF** page. **<Lines & Areas:>** Defines if lines and areas are exported as Line or Polyline entities. **<Dimensions:>** Defines the dimension of the DXF file.

Step	Description
☞	**<DXF Layer:>** Defines the DXF Layer as **<Default>**, **<Code Group>**, **<Code>**, **<Code+Attri>** or **<Code+Descr+Attri>**. **PAGE (F6)** changes to the **Labels** page. The settings on this page define which labels with information (Point ID, Coords, Height and Pt Code) for each point are exported. Each label can be exported as separate layer or in the same layer as the point is exported. For each label the color can be defined and for user defined labels the DXF layer name can also be defined. Additionally the decimals can be defined for the Coords and Height label.
2.	**CONT (F1)** accepts the changes and returns to **EXPORT Export DXF from Job**.
3.	**CONT (F1)** exports the data.
☞	Message: **Do not remove CF Card!**
4.	Information message: Are more data to be exported? If **yes**, continue with step 5. If **no**, continue with step 6.
5.	**YES (F6)**. Repeat steps 1. to 4.
6.	**NO (F4)** returns to the **R9 Main Menu**.

14 Convert...\Import Data to Job

14.1 Overview

Description

This screen lists all the importers loaded. The data to import are stored on the CompactFlash card.

Data can be imported to a job on the CompactFlash card.

Import formats

Format	Characteristic	Description
ASCII	Import variables	Point ID, grid coordinates, thematical codes. No free codes, no attributes.
	Format definition	Free format. Use and order of variables and delimiter can be defined during import.
	Units	As currently configured on the instrument.
	Height	Orthometric
	Specialities	
	Local heights but no coordinates in file	Points are imported without coordinates but with local height and code if available.
	Coordinates but no heights in file	Points are imported without height but with coordinates and code if available.
	Neither coordinates nor heights in file	No import.

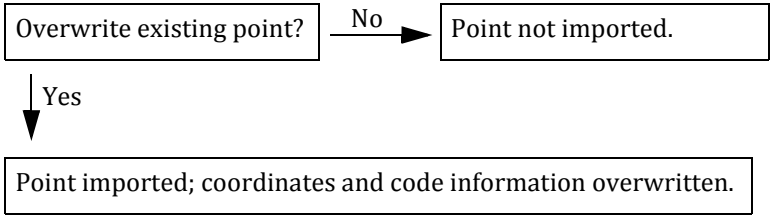
Format	Characteristic	Description
	No point ID's in file	No import.
GSI8 **GSI16**	Import variables	Point ID WI 11, local coordinates WI 81, WI 82, WI 83, thematical codes WI 71. No free codes, no attributes. Refer to "19.1 GSI Output" for information on GSI Format.
	Format definition	Fixed format. Easting and Northing can be switched during import.
	Units	As defined in the GSI file.
	Heights	Orthometric
	Specialities	
	Local heights but no coordinates in file	Points are imported without coordinates but with local height and code if available.
	Coordinates but no heights in file	Points are imported without height but with coordinates and code if available.
	Neither coordinates nor heights in file	No import.
	No point ID's in file	No import.
DXF	Import variables	Block, point, line, arc, polyline. Local coordinates. No free codes, no attributes.
	Format definition	Fixed format (X/Y/Z).
	Units	Not predefined.
	Heights	Z value imported as orthometric.

Format	Characteristic	Description
	Specialities	
	Neither coordinates nor heights in file	No import

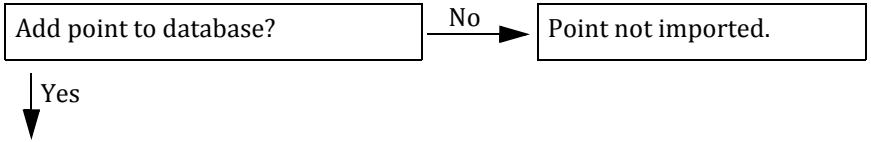
Checks

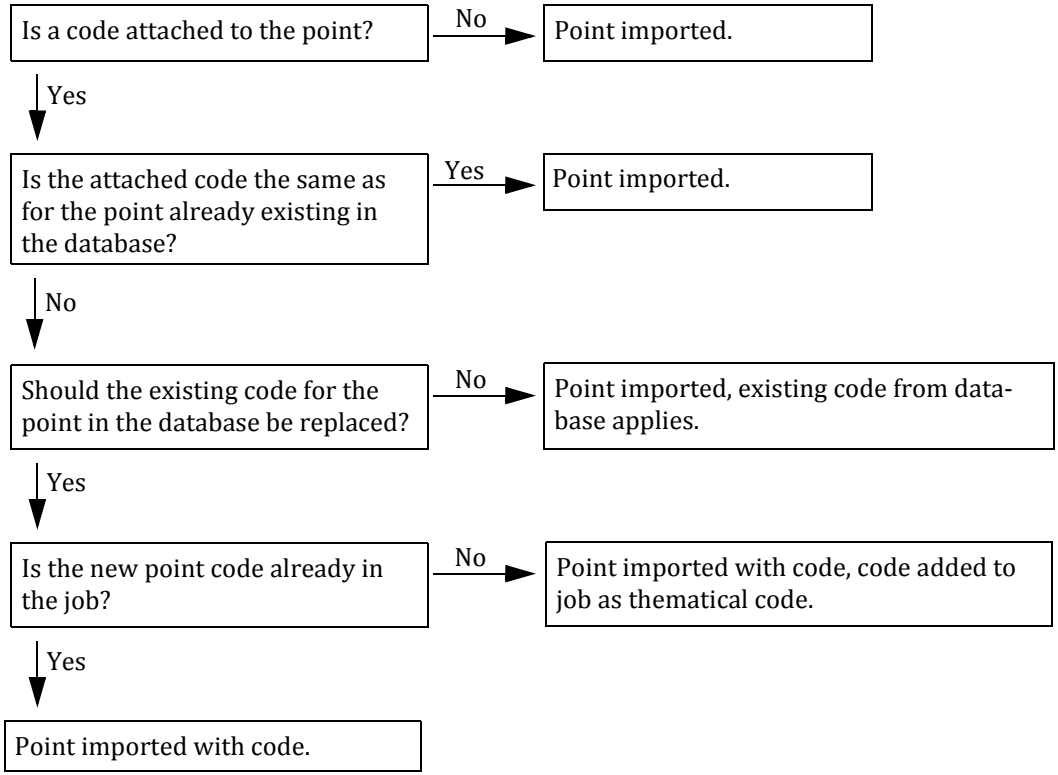
Points are always imported with the class **CTRL** and a coordinate quality of **-----**.
Refer to "7.3.1 Terminology".
While importing points to a job, checks are performed against point ID, class and coding of points already existing in the job.

Case 1: Point already exists in database with class CTRL



Case 2: Point already exists in database with a class other than CTRL




Is a code attached to the point?
No
Point imported.
Yes
Is the attached code the same as for the point already existing in the database?
Yes
Point imported.
No
Should the existing code for the point in the database be replaced?
No
Point imported, existing code from database applies.
Yes
Is the new point code already in the job?
No
Point imported with code, code added to job as thematical code.
Yes
Point imported with code.

14.2 Accessing the Data Import Functionality

Access

Select **Main Menu: Convert...\Import Data to Job**.

OR

Press **USER**. Refer to "2 USER Key" for information on the **USER** key.

Next step

IF importing data in	THEN
ASCII format	Refer to "14.3 Importing Data in ASCII Format".
GSI format	Refer to "14.4 Importing Data in GSI Format".
DXF format	Refer to "14.5 Importing Data in DXF Format".

14.3 Importing Data in ASCII Format

Requirements

At least one ASCII file with any file extension is stored in the \DATA directory of the CompactFlash card.

Access

Refer to "14.2 Accessing the Data Import Functionality" to access **IMPORT Import ASCII/GSI Data to Job**.

Import data step-by-step

Step	Description
1.	**IMPORT Import ASCII/GSI Data to Job** **<Import: ASCII Data>** **<From File**:> All files in the \DATA directory on the CompactFlash card can be selected. **<To Job:>** Choosing a job as destination for import makes this job the active job. All jobs from **Main Menu: Manage...\Jobs** can be selected. **<Header:>** This option allows up to ten header lines which may exist in an ASCII file to be skipped. Select the number of header lines.
2.	**CONF (F2)** defines the format of the data to be imported.
3.	**IMPORT Define ASCII Import** **<Delimiter:>** The separator between the import variables. **<Multi Spaces:>** Available for **<Delimiter: Space>**. **<Multi Spaces: No>** for space delimited data having one space between the variables. **<Multi Spaces: Yes>** for space delimited data having multi spaces between the variables.

Step	Description
	<No. Lines/Pt:> Available for **<Delimiter: Line Feed>**. The number of lines used to describe each point. Select the delimiter and the positions of the particular variables.
☞	**DEFLT (F5)** recalls the default ASCII import settings.
4.	**CONT (F1)** leads back to **IMPORT Import ASCII/GSI Data to Job**
5.	**CONT (F1)** imports the data.
☞	Points with a height > 20000 m are not imported.
6.	Information message: Are more data to be imported? • If **yes**, continue with step 7. • If **no**, continue with step 8.
7.	**YES (F6)**. Repeat steps 1. to 6.
8.	**NO (F4)** returns to the **R9 Main Menu**.

14.4 Importing Data in GSI Format

Requirements

At least one ASCII file in GSI format with the file extension *.gsi is stored in the GSI directory of the CompactFlash card.

Access

Refer to "14.2 Accessing the Data Import Functionality" to access **IMPORT Import ASCII/GSI Data to Job**.

Import data step-by-step

Step	Description
1.	**IMPORT Import ASCII/GSI Data to Job** **<Import: GSI Data>** **<From File:>** All files with extension *.gsi in the \GSI directory on the CompactFlash card can be selected. **<To Job:>** Choosing a job as destination for import makes this job the active job. All jobs from **Main Menu: Manage...\Jobs** can be selected.
	CONF (F2) accesses **IMPORT Define GSI Import**. For **<Switch WI81/WI82: Yes>** all WI 81 data, normally Easting, is imported as Northing and all WI 82 data, normally Northing, is imported as Easting. This coordinate switch is necessary for “left handed” coordinate systems.
2.	**CONT (F1)** imports the data.
	Points with a height > 20000 m are not imported.
3.	Information message: Are more data to be imported? • If **yes**, continue with step 4. • If **no**, continue with step 5.

Step	Description
4.	**YES (F6)**. Repeat steps 1. to 3.
5.	**NO (F4)** returns to the **R9 Main Menu**.

14.5 Importing Data in DXF Format

Requirements

At least one file in DXF format with the file extension *.dxf has to be stored in the \DATA directory of the CompactFlash card.

Access

Refer to "14.2 Accessing the Data Import Functionality" to access **IMPORT Import DXF Data to Job**.

Import data step-by-step

Step	Description
1.	**IMPORT Import DXF Data to Job** **<From File:>** All files with extension *.dxf in the \DATA directory on the CompactFlash card can be selected. **<To Job:>** Choosing a job as destination for import makes this job the active job. All jobs from **Main Menu: Manage...\Jobs** can be selected.
	CONF (F2) accesses **IMPORT Configuration**. **<Block Prefix:>** Optional prefix to imported blocks. **<Point Prefix:>** Optional prefix to imported points. **<Line Prefix:>** Optional prefix to imported lines. **<File Units:>** Choosing the unit for the DXF data to be imported. **<Create Vertex Points:>** Option if points will be created at vertices of the imported line/arc/polyline elements. **<Convrt White Elements:>** Option if white colored elements will be converted to black colored elements.

Step	Description
	<Exclude Height:> Height value inside the DXF file are considered invalid and will not be converted.
2.	**CONT (F1)** leads back to **IMPORT Import DXF Data to Job**
3.	**CONT (F1)** imports the data.
☞	Message: **Do not remove CF Card!**
4.	Information message: Are more data to be imported? If **yes**, continue with step 5. If **no**, continue with step 6.
5.	**YES (F6)**. Repeat steps 1. to 4.
6.	**NO (F4)** returns to the **R9 Main Menu**.

15 Config...\Survey Settings...

15.1 ID Templates

15.1.1 Overview of Templates

Description

- ID templates are predefined templates for point, line or area numbers. ID templates save having to type in the ID for each object. They are useful when many points are collected.
- ID templates that are selected to be used suggest ID's for **Point ID**, **Line ID** and **Area ID** whenever points, lines and areas are to be surveyed.

Description of the default ID templates

Default ID Template	Description
0001	• Suggested as ID for measured points in default configuration sets. • This ID is automatically incremented.
Area0001	• Suggested as ID for areas in default configuration sets. • This ID is automatically incremented.
Auto0001	• Suggested as ID for auto points in default configuration sets. These points are automatically recorded at a specific rate. • This ID is automatically incremented.
Aux0001	• Suggested as ID for auxiliary points in default configuration sets. These points are used when measuring a hidden point. • This ID is automatically incremented.
Line0001	• Suggested as ID for lines in default configuration sets. • This ID is automatically incremented.

Default ID Template	Description
No Template Used	• The last point ID during a survey will be displayed. This ID is automatically incremented if it contains numerical characters. If this ID is overwritten, the auto increment starts from the new ID. The automatic incrementation can be turned off when editing this ID template. Refer to "15.1.4 Editing an ID Template".
Time & Date	• The current local time and date is the ID.

Use Code&String	• Allows the line/area ID assigned to a line/area object to be based on the code related to the line/area.
	  • If line/area codes are being used then the line/area code is used as part of the line/area ID.
	  • If point codes are being used then the point code is used as part of the line/area ID.
	  • If attributes/strings are not being used then the numerical part of the line/area ID is automatically incremented.

Availability of the default ID templates

Default ID Template	Availability:			
	Survey Points	Auto Points	Lines	Areas
0001	✓	✓	✓	✓
Area0001	✓	✓	✓	✓
Auto0001	✓	✓	✓	✓
Aux0001	✓	✓	✓	✓
Line0001	✓	✓	✓	✓
No Template Used	✓		✓	✓
Time & Date	✓	✓	✓	✓
Use Code&String			✓	✓

Selecting the default ID templates

- A default ID template can be selected:
  - manually, by selecting it in the ID Template Library under **Config \Survey Settings \ID Templates**. The ID template becomes active as soon as it is highlighted on the screen and when **CONT (F1)** is pressed. The currently active configuration set is automatically updated, to include the selected ID template. To ensure that all default ID templates appear in the ID Template Library, press **SHIFT DEFLT (F5)**.
  - indirectly, by selecting a configuration set which includes the ID template.

15.1.2 Accessing ID Template Configuration

Access

Select **Main Menu: Config...\Survey Settings...\ID Templates**.

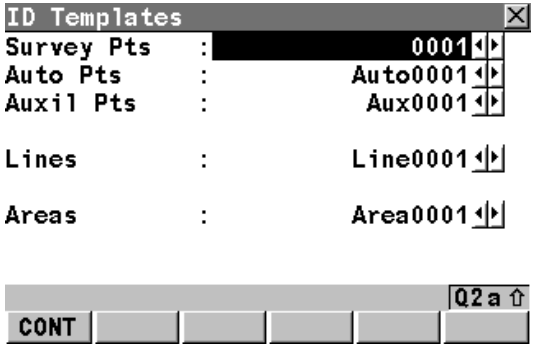
OR

Press **USER**. Refer to "2 USER Key" for information on the **USER** key.

OR

Within the configuration set wizard. Refer to "11.2 Accessing Configuration Set Management".

CONFIGURE ID Templates



CONT (F1)

To accept changes and return to the screen from where this screen was accessed.

Description of fields

Field	Option	Description
<Survey Pts:>	Choicelist	Sets the ID templates for measured points.
<Auto Pts:>	Choicelist	Sets the ID templates for auto points. These points are automatically recorded at a specific rate.
<Auxil Pts:>	Choicelist	Sets the ID templates for auxiliary points. These points are used when trying to find a stake-out point.
<Lines:>	Choicelist	Sets the ID templates for lines.
<Areas:>	Choicelist	Sets the ID templates for areas.

Next step

IF an ID template	THEN
is to be selected	select the desired ID template. **CONT (F1)** to close the screen and to return to the screen from where **CONFIGURE ID Templates** was accessed.
is to be created	Refer to "15.1.3 Creating a New ID Template".
is to be edited	Refer to "15.1.4 Editing an ID Template".
is to be deleted	Refer to "15.1.5 Deleting an ID Template".

15.1.3 Creating a New ID Template

Create ID template step-by-step

Step	Description
1.	Refer to "15.1.2 Accessing ID Template Configuration" to access **CONFIGURE ID Templates**.
2.	In **CONFIGURE ID Templates** highlight any field.
3.	**ENTER** to access **CONFIGURE ID Template Library**.
4.	Highlight an ID template. A copy of this ID template is taken for further configurations.
5.	**NEW (F2)** to access **CONFIGURE New ID Template**.
6.	**CONFIGURE New ID Template** **<ID:>** The name of the ID template and the format of the ID object. Any characters including spaces are allowed. Leading spaces are not accepted. **<Increment:>** ID's are incremented numerical or alphanumerical. **<Increment By:>** The amount by which the point ID is incremented. **<Cursor Posn:>** The character position at which the cursor is placed when **ENTER** is pressed in **<Point ID:>** when surveying points. **<Cursor Posn: Last Character>** means that the cursor is placed immediately to the right of the last character. Adapt the settings according to the requirements.
7.	**CONT (F1)** stores the new ID template into the ID template library and returns to **CONFIGURE ID Template Library**.
8.	**CONT (F1)** returns to **CONFIGURE ID Templates**.

Step	Description
9.	**CONT (F1)** returns to the screen from where **CONFIGURE ID Templates** was accessed.

Examples for incrementation

For <Increment: Numeric only>

The rightmost numeric part is incremented within the point ID.

<ID:>	<Increment By:>	Next point ID	Notes
Point994	5	Point999 Point1004 ...	-
994point	5	999point 1004point ...	-
123point123	-10	123point113	Right hand side numbers are incremented. Negative increments allowed.
Point11	-6	Point5 Point-1 Point-7 Point-13 ...	-
Abcdefghijklmn94	5	Abcdefghijklmno99 Point ID increment fail	Incrementation fails if next increment will result in more than 16 characters.

<ID:>	<Increment By:>	Next point ID	Notes
Abcdefghijklmno9	-5	Abcdefghijklmnop4 Point ID increment fail	Negative incrementing fails if next increment requires negative sign and will result in more than 16 characters.

For <Increment: Alphanumeric>

The rightmost character within the point ID is incremented regardless of whether that character is numeric or alphanumeric.

Template	Increment value	Next point ID's	Notes
Point994	5	Point999 Point99E Point99J ...	-
994point	5	994poiny Point ID increment fail	Lower case alpha characters increment until z is reached. Then a new point ID must be entered.
Abcdef	-5	Abcdea AbcdeV ... AbcdeB Point ID increment fail	Lower case alpha characters decrement from lower to upper case until A is reached. Then a new point ID must be entered.

Template	Increment value	Next point ID's	Notes
ABCDEB	5	ABCDEB ABCDEG ... Abcdez Point ID increment fail	Upper case alpha characters increment from upper to lower case until z is reached. Then a new point ID must be entered.

15.1.4 Editing an ID Template

Edit ID template step-by-step

Step	Description
1.	Refer to "15.1.2 Accessing ID Template Configuration" to access **CONFIGURE ID Templates**.
2.	In **CONFIGURE ID Templates** highlight any field.
3.	**ENTER** to access **CONFIGURE ID Template Library**.
4.	**CONFIGURE ID Template Library** Highlight the ID template to be edited. The ID template **Time & Date** cannot be edited. **EDIT (F3)**.
5.	**CONFIGURE Edit ID Template** The type of ID template selected for editing determines the availability of the fields on this screen. • Available for the default ID template **No Template Used**: **<ID:>** The name of the ID template cannot be changed since it is a default ID template. The other fields on this screen are the same as in **CONFIGURE New ID Template**. Refer to "15.1.3 Creating a New ID Template". • Available for a user defined ID template: All fields on this screen are the same as in **CONFIGURE New ID Template**. Refer to "15.1.3 Creating a New ID Template". Adapt the settings according to the requirements.
6.	**CONT (F1)** stores the changes and returns to **CONFIGURE ID Template Library**.

Step	Description
7.	**CONT (F1)** returns to **CONFIGURE ID Templates**.
8.	**CONT (F1)** returns to the screen from where **CONFIGURE ID Templates** was accessed.

15.1.5 Deleting an ID Template

Delete ID template step-by-step

Step	Description
1.	Refer to "15.1.2 Accessing ID Template Configuration" to access **CONFIGURE ID Templates**.
2.	In **CONFIGURE ID Templates** highlight any field.
3.	**ENTER** to access **CONFIGURE ID Template Library**.
4.	**CONFIGURE ID Template Library** Highlight the ID template to be deleted. **DEL (F4)**.
☞	It does not matter if the ID template is being used in a configuration set. The ID template will be rebuilt when that configuration set becomes active.
5.	**YES (F4)** returns to the **CONFIGURE ID Template Library**.
6.	**CONT (F1)** returns to **CONFIGURE ID Templates**.
7.	**CONT (F1)** returns to the screen from where **CONFIGURE ID Templates** was accessed.

15.1.6 Working Example

Description

Application:
- Pick up points with many different point ID's.
- Most point ID's require an incrementing number behind a text.

Working technique: Application program Survey.

Goal:
- The first point ID's for survey points are Bolt 001, Bolt 002, ...
- A different point ID can be entered during the survey.
- The following point ID's will be based on the entered point ID.
- An individual point ID can be typed in for one point.

Requirement

Application program Survey is selected. Refer to "35 Survey - General" for more information on Survey.

Configuration of ID template step-by-step

Step	Description
1.	Refer to "15.1.3 Creating a New ID Template". Follow step 1. to 4.
2.	**CONFIGURE New ID Template** **<ID: Bolt 001>** **<Increment: Numeric only>** **<Increment By: 1>** **<Cursor Posn: 1>**
3.	**CONT (F1)** closes the screen and returns to **CONFIGURE ID Template Library**.
4.	**CONT (F1)** returns to **CONFIGURE ID Templates**.

Step	Description
5.	**CONFIGURE ID Templates** **<Survey Pts: Bolt 001>**
6.	**CONT (F1)** returns to the screen from where **CONFIGURE ID Templates** was accessed.

Field procedure step-by-step

Step	Description
1.	Refer to "35.2 Surveying Points" to access **SURVEY Survey: Job Name**.
2.	**SURVEY Survey: Job Name** **<Point ID: Bolt 001>** is shown automatically.
3.	**ALL (F1)**. **<Point ID: Bolt 002>** is shown automatically.
4.	Repeat step 3. until all points with the ID Bolt XXX are surveyed.
5.	**SURVEY Survey: Job Name** The next point ID's are RoadXXXX, starting with Road0723. Type Road0723 **<Point ID: Road0723>**.
6.	**ALL (F1) <Point ID: Road0724>** is shown automatically.
7.	Repeat step 6. until all points with the ID RoadXXXX are surveyed.
8.	**SURVEY Survey: Job Name** The next required point ID is BM98. It is valid for one point. **SHIFT INDIV (F5)**
9.	**SURVEY Survey: Job Name** Type BM98 **<Indiv Pt ID: BM98>**.

Step	Description
10.	**ALL (F1)**. The system changes back to the point ID's RoadXXXX.

15.2 Display Settings

Description

Display settings define the parameters shown on a page on the **SURVEY** screen.

Four display masks are definable.

Mask 1:	Always shown on the **SURVEY** screen.
Mask 2:	Can be shown or hidden on the **SURVEY** screen.
Mask 3:	Can be shown or hidden on the **SURVEY** screen.
Mask 4:	Never shown on the **SURVEY** screen. Reserved for application programs.

The settings on this screen define the layout of the four display masks.

Access

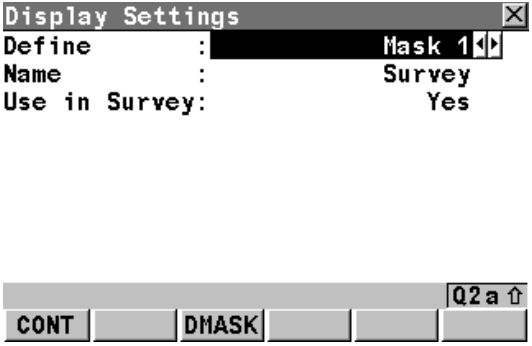
Select **Main Menu: Config...\Survey Settings...\Display Settings.**

OR

Press **USER**. Refer to "2 USER Key" for information on the **USER** key.

OR

Within the configuration set wizard. Refer to "11.2 Accessing Configuration Set Management".



CONT (F1)
To accept changes and return to the screen from where this screen was accessed.

DMASK (F3)
To configure the selected display mask. Refer to paragraph "CONFIGURE Define Display Mask n".

Description of fields

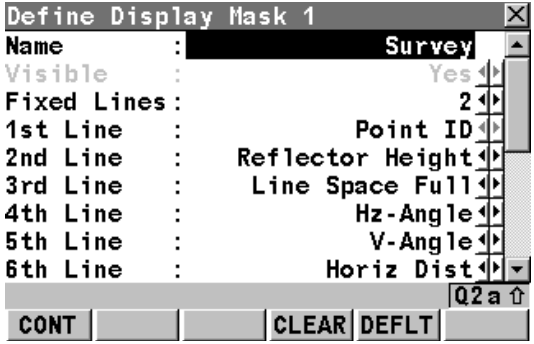
Field	Option	Description
<Define:>	**Mask** **1**, **2**, **3** or **4**	Selected display mask.
<Use in Survey:>	Output	Indicates if the display mask is shown or hidden as a page in **SURVEY**.

Next step

IF a display mask	THEN
is not to be edited	**CONT (F1)** closes the screen and returns to the screen from where **CONFIGURE Display Settings** was accessed.

IF a display mask	THEN
is to be edited	highlight the display mask and **DMASK (F3)**. Refer to paragraph "CONFIGURE Define Display Mask n".

CONFIGURE
Define Display Mask n



CONT (F1)
To accept changes and to return to **CONFIGURE Display Settings**.

CLEAR (F4)
To set all fields to **<XX. Line: Line Space Full>**.

DEFLT (F5)
To recall the default settings.

Description of fields

Field	Option	Description
<Visible:>	**Yes** or **No**	Shows or hides the display mask as a page in **SURVEY**.
<Fixed Lines:>	From **0** to **5**	Defines how many lines do not scroll in the survey screen when that display mask is used.
<1st Line:>	Output	Fixed to **<1st Line: Point ID>**.
<2nd Line:> to **<16th Line:>**		For each line one of the following options can be selected.

Field	Option	Description
	Add. Constant	Output field for additive constant of currently selected reflector.
	Angle Right	Displays the horizontal angle difference between the backsight point and the current telescope position.
	Annotation 1-4	Input field for comments to be stored with the point.
	Attrib (free) 01-20	Output field for attributes for free codes.
	Attrib 01-20	Input field for attributes for point codes.
	Automation	Select automation type.
	Avg Max #Dist	Input field for maximum number of distance measurements in the averaging EDM mode.
	Azimuth	Output field for the azimuth.
	Backsight Pt ID	Output field for point ID of backsight point if Quickset method was used in Setup application program.
	Code	Output field for free codes.
	Code (free)	Input field for free codes.
	Code Desc	Output field for the description of codes.
	Code Desc (free)	Output field for the description of free codes.
	Code Type	Output field for the type of code, for example point code, line code or area code.

Field	Option	Description
	EDM Mode	Select EDM measurement mode.
	EDM Type	Select EDM type.
	Easting	Output field for Easting coordinate of measured point.
	Height	Output field for the height coordinate of the measured point.
	Height Diff	Output field for the height difference between station and reflector.
	Horiz Dist	Output field for horizontal distance.
	Hz-Angle	Output field for the horizontal angle.
	Instrument Ht	Output field for the instrument height.
	Line Space Full	Insert full line space.
	Line Space Half	Insert half line space.
	Linework	Choicelist with option for flagging a line/area. Refer to "15.3 Coding & Linework Settings".
	Longitudinal Tilt	Output field for the longitudinal tilt of the vertical axis.
	No. of Dists	Output field for number of averaged distances measured with EDM mode averaging.
	Northing	Output field for Northing coordinate of measured point.

Field	Option	Description
	Offset Cross	Input field for horizontal distance offset for measured point, perpendicular to the line of sight.
	Offset Height	Input field for height offset for measured point.
	Offset Length	Input field for horizontal distance offset, in the direction of line of sight.
	Offset Mode	Select offset mode.
	PPM Atmos	Output field for atmospheric ppm value.
	PPM Geom	Output field for geometric ppm value.
	PPM Total	Output field for the total ppm value.
	Point ID	Input field for the point number.
	Reflector	Select a reflector.
	Reflector Height	Input field for reflector height.
	SD-Last Rec	Output field for the last recorded distance.
	Slope Dist	Output field for measured slope distance.
	Station East	Output field for current station Easting coordinates.
	Station Height	Output field for current station height coordinates.
	Station ID	Output field for current station ID.

Field	Option	Description
	Station North	Output field for current station Northing coordinates.
	Std Dev	Output field of standard deviation in millimeters of averaged distances.
	Transversal Tilt	Output field for the transversal tilt of the vertical axis.
	V-Angle	Output field for vertical angle.
	V-Display	Select vertical angle display.

Next step

Step	Description
1.	**CONT (F1)** returns to **CONFIGURE Display Settings**.
2.	**CONT (F1)** returns to the screen from where **CONFIGURE Display Settings** was accessed.

15.3 Coding & Linework Settings

Description

The settings on this screen define the method of coding, for both points and lines.
Refer to "9 Coding" for a complete description of coding.

Access

Select **Main Menu: Config...\Survey Settings...\Coding & Linework Settings**.

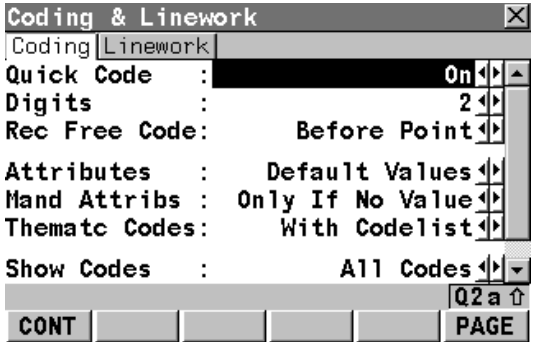
OR

Press **USER**. Refer to "2 USER Key" for information on the **USER** key.

OR

Within the configuration set wizard.
Refer to "11.2 Accessing Configuration Set Management".

CONFIGURE
Coding & Linework,
Coding page



CONT (F1)
To accept changes and return to the screen from where this screen was accessed.

PAGE (F6)
To change to another page on this screen.

Description of fields

Field	Option	Description
<Quick Code:>	**Never**	Prevents the use of quick coding completely.
	On	Allows the use of quick coding and activates it.
	Off	Allows the use of quick coding, but keeps it deactivated.
<Digits:>	**1**, **2** or **3**	Available unless **<Quick Code: Never>**. Sets the mostly used number of digits for the quick code. Quick codes with less digits can still be used. While typing a quick code during a survey, using **ENTER** after typing one or two digits of the quick code indicates the end of the input.
<Rec Free Code:>	**After Point** or **Before Point**	Determines if a free code measured with a quick code is stored before or after the point. This field is disabled when **<Quick Code: Never>**.
<Attributes:>		Determines the attribute values displayed under certain circumstances. This is applicable to both the storing and displaying of attribute values.
	Default Values	When available, the default attribute values, as stored in the job, are displayed and stored.
	Last Used	When available, the last used attribute values as stored in the job are displayed and stored.

Field	Option	Description
<Mand Attribs:>	**Always Prompt**	The screen **XX Enter Mandatory Attribute** will always appear when codes, having one or more attributes of attribute type mandatory, are being stored. Attributes of attribute type mandatory or fixed can only be created in Stonex® Tools.
	Only If No Value	The screen **XX Enter Mandatory Attribute** will only appear when codes, having one or more attributes of attribute type mandatory, are being stored without an attribute value. Attributes of attribute type mandatory can only be created in Stonex® Tools.
	Code Change Only	The screen **XX Enter Mandatory Attribute** will only appear when a new code with a mandatory attribute was selected.
<Thematc Codes:>		Sets the coding method.
	With Codelist	Codes stored within the job codelist can be selected to code points, lines and areas.
	Without Codelist	Codes stored within the job codelist cannot be selected to code points, lines and areas. Each code must be entered.
<Show Codes:>	**Only Pt Codes**	Only point codes will be available in the choicelist for **<Code:>/<Point Code:>** in a display mask of an application program.

Field	Option	Description
	All Codes	All codes of the job codelist will be available in the choicelist for **<Code:>/<Point Code:>** in a display mask of an application program. Selecting a line/area code opens a new line/area.
<String Attrib:>	Choicelist	Available for **<Show Codes: All Codes>**. When this field is active, surveyed points that have the same code attached are strung to one line.

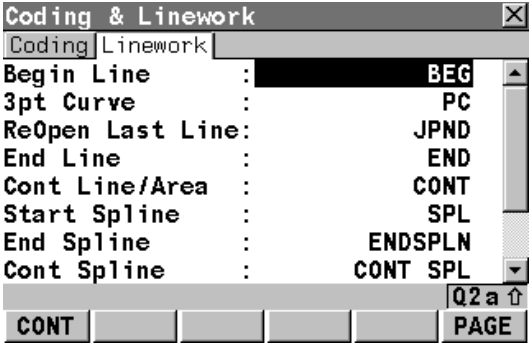
Next step
PAGE (F1) changes to the **Linework** page.

CONFIGURE
Coding & Linework,
Linework page

The flags for Linework are defined on this screen. A flag

- is stored as a property of a point.
- can be exported with a format file.
- is different to a code.

The flags defined on this screen are linked to the options available for **<Linework:>** in a display mask of an application program. The selection for **<Linework:>** in a display mask determines the flag stored with a point. The availability of **<Linework:>** in a display mask is configured in **CONFIGURE Define Display Mask n**. Refer to "10 Linework" for information on Linework.



CONT (F1)
To accept changes and return to the screen from where this screen was accessed.

PAGE (F6)
To change to another page on this screen.

Description of fields

Field	Option	Description
<Begin Line:>	User input	Opens a new line when the next point is stored. Any lines which are currently open are closed. The point may or may not be stored with a point code.
<3pt Curve:>	User input	Stores the linework flag for a curve through the next three measured points and continues a line/area.
<ReOpen Last Line:>	User input	Opens the last used line again.
<End Line:>	User input	Closes all open lines.
<Cont Line/Area:>	User input	Indicates a line/area is open.
<Start Spline:>	User input	Stores the linework flag for beginning a spline and continues any open line/area.

Field	Option	Description
<End Spline:>	User input	Stores the linework flag to stop a spline.
<Cont Spline:>	User input	Indicates a line/area is open with spline line type.
<Begin Area:>	User input	Opens a new area when the next point is stored. Any areas which are currently open are closed. The point may or may not be stored with a point code.
<ReOpen Last Area:>	User input	Opens the last used area again.
<Close Area:>	User input	Closes all open areas.

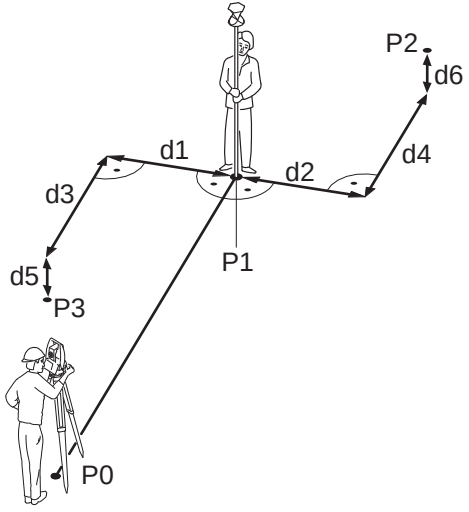
Next step

PAGE (F6) changes to the first page on this screen.

15.4 Offsets

Description

Offsets can be configured and entered. The offset values are applied to measured points. The Offset function allows offset points to be determined, for instance when the reflector cannot be set up directly on a point. Transverse, longitudinal and/or elevation offsets can be defined from the reflector position to the offset point. All of the displayed and recorded measurement data is in relation to the offset point. The values for target eccentricity is retained after storage with **<Offset Mode: Permanent>**. The values are set to zero with **<Offset Mode: Reset after REC>**.



P0	Station
P1	Current position
P2	Offset point
P3	Offset point
d1	Offset cross -
d2	Offset cross +
d3	Offset length -
d4	Offset length +
d5	Offset height -
d6	Offset height +

If configured in a display mask, the offset values appear also in the display mask in Survey.

Access

Select **Main Menu: Config...\Survey Settings...\Offsets**.

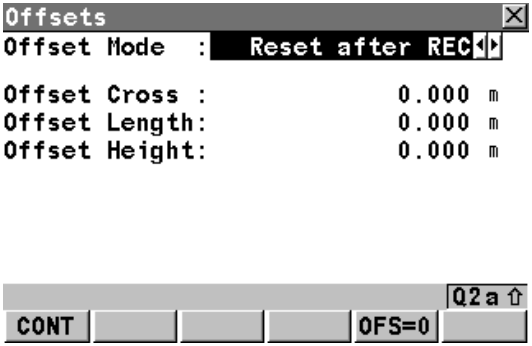
OR

Press **USER**. Refer to "2 USER Key" for information on the **USER** key.

OR

Within the configuration set wizard. Refer to "11.2 Accessing Configuration Set Management".

CONFIGURE
Offsets



CONT (F1)
To accept changes and return to the screen from where this screen was accessed.

OFS=0 (F5)
To set all offsets to 0.000.

Description of fields

Field	Option	Description
<Offset Mode:>	**Reset after REC**	The offset values are reset to 0.000 after a point is measured with **REC (F3)** or **ALL (F1)**.
	Permanent	The offset values are applied to every measured point until reset or changed.
<Offset Cross:>	User input	Sets cross offset of target point, perpendicular to the line of sight.
<Offset Length:>	User input	Sets length offset of target point, in the direction of the line of sight.
<Offset Height:>	User input	Sets height offset of target point.

Next step

CONT (F1) returns to the screen from where **CONFIGURE Offsets** was accessed.

15.5 Target Check

Description

- It is possible to configure the instrument to monitor sequentially stored measurements and to notify the user if the coordinates lie within a defined range from each other.
- If configured, when a point is being stored the X,Y coordinates of the point being stored are compared to those of the last previously stored point. If the difference is less than the defined position tolerance then a warning is shown. It can now be decided whether to store the point or not.
- If configured, then backsight target points and resection target points which were measured during the setup procedure are also checked in this manner.

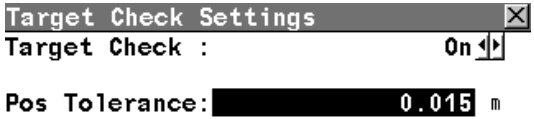
Access

Select **Main Menu: Config...\Survey Settings...\Target Check**.

OR

Press **USER**. Refer to "2 USER Key" for information on the **USER** key.

Configuring the target check



CONT (F1)
To accept the screen entries and continue.

Description of fields

Field	Option	Description
<Target Check:>	**On**	Target checking is activated.
	Off	Target checking is not activated.
<Pos Tolerance:>	User input	The position tolerance. The units are defined by **Config \General Settings \Units & Formats**.

16 Config...\Instrument Settings...

16.1 EDM & iLock Settings

Description

- The settings on this screen define the active EDM **E**lectronic **D**istance **M**easurement and iLock settings.
- Refer to "29 Functions" for detailed information on EDM and iLock.

- Descriptions apply in general to R9 instruments.
- Available options depend on the purchased model, for example with or without iLock.

Access

Select **Main Menu: Config...\Instrument Settings...\EDM & iLock Settings**.

OR

Press **USER**.

Refer to "2 USER Key" for information on the **USER** key.

OR

Press **SHIFT USER**.

Refer to "3 Quick Settings - SHIFT USER" for information on the **SHIFT USER** key.

OR

Within the configuration set wizard.

Refer to "11.2 Accessing Configuration Set Management".

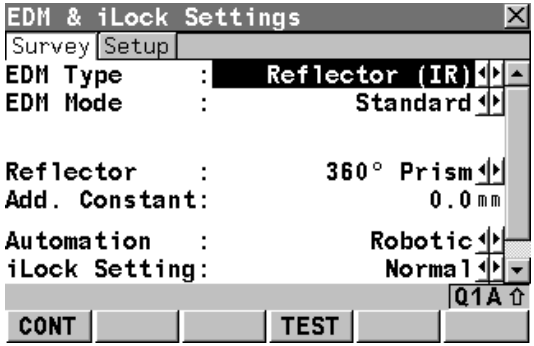
CONFIGURE
EDM & iLock Settings, Survey page
Setup page

Description

- This screen has two pages - the Survey page and the Setup page.
- The Survey page and Setup page contain identical fields.

- The settings made in the Survey page are used by all applications and all measurements taken outside of the Setup application program.
- The settings made in the Setup page are only used inside the Setup application program.
- Any changes made to the EDM & iLock Settings (for example via Icons, Quick Set, Hotkeys) while the Setup application program is active, only affect the Setup EDM & iLock settings.
- Any changes made to the EDM & iLock Settings (for example via Icons, Quick Set, Hotkeys) while the Setup application program is not active, only affect the Survey EDM & iLock settings.
- When entering the Setup application program, the Setup EDM & iLock Settings are active.
- When leaving the Setup application program, the Survey EDM & iLock Settings are active.
- Both Survey and Setup EDM & iLock Settings are part of the configuration sets.

Diagram



CONT (F1)
To accept changes and return to **R9 Main Menu**.

TEST (F4)
To access the **CONFIGURE EDM Test Signal/Frequency** screen.

PAGE (F6)
To change to other page on screen.

Description of fields

Field	Option	Description
<EDM Type:>	**Reflector (IR)**	All fields are set to the last used options. The IR EDM exists for all instrument types and allows to measure the distance to a prism or a tape. IR is the EDM that can be used with iLock and Robotic. For **<Automation: iLock>** or **<Automation: Robotic>** **<EDM Type: Reflector (IR)>** is automatically set. Whenever **<EDM Type: Reflector (IR)>** is selected, the last setting for **<Automation:>** which was used with reflector is set. When activated, **IR** is displayed as an icon.
	Reflctrless (RL)	**<Automation: None>** and **<Reflector: Reflector-less>** are selected. The other fields are set to the last used options. When activated, **RL** is displayed as an icon.
	Long Range (LO)	**<Automation: None>** is selected. Last used options are reset for the other fields. When activated, **LO** is displayed as an icon.
<EDM Mode:>	**Standard**	Available for all **<EDM Type:>** options. Standard single distance measurement. When activated, **STD** is displayed as an icon.
	Fast	Available only for **<EDM Type: Reflector (IR)>**. Fast single distance measurement.

Field	Option	Description
		When activated, **FAST** is displayed as an icon.
	Tracking	Available unless **<EDM Type: Long Range (LO)>**. Continuous distance measurement.
		When activated, **TRK** is displayed as an icon.
	SynchroTrack	Available only for **<EDM Type: Reflector (IR)>**. This is the measurement mode for the interpolation of angle measurements in IR Robotic tracking mode. In difference to normal IR Robotic tracking mode, where angle measurements are only assigned to certain distance measurements, SynchroTrack will perform a linear interpolation between the previous and following angle measurement, based upon the timestamp of the EDM measurement.
		Using this interpolation procedure, a higher accuracy for all dynamic applications (for example machine guidance) is possible.
		When activated, **SYNC** is displayed as an icon.
	Average	Available for all **<EDM Type:>** options. Repeats measurements in standard measuring mode. The average distance of **<AVG Max #Dist:>** and the standard deviation for the averaged distance are calculated.
		When activated, **AVG** is displayed as an icon.

Field	Option	Description
<AVG Max #Dist:>	User input	Available if **<EDM Mode: Average>**. Input field for the maximum number of distances to be averaged from 2 to 999 distances.
<Reflector:>	Choicelist	Reflector names as configured in **Main Menu: Manage...\Reflectors**.
<Add. Constant:>	Output	The additive constant stored with the chosen reflector.
<Automation:>	**None**	Measurements are done without iLock.
	iLock	Positioning to static prisms.
	Robotic	The instrument locks onto and follows the moving prism.
<iLock Settings:>		iLock Settings.
	Normal	Normal Mode is turned on.
	Low Vis On	Low Visability Mode is turned on. To increase the instrument measuring ability during suboptimal weather conditions. Available only when iLock or Robotic mode is activated. This mode is automatically deactivated when the instrument is turned off.
	Low Vis Always On	Low Visability Mode is permanently turned on.
	S-Range On	Short Range Mode is turned on.

Field	Option	Description
		This mode is designed for survey work at close range from the instrument (up to 60-80 m). Under these conditions the instrument Robotic Mode is significantly stabilised. This mode has a considerable influence on the range (restriction to 100-150 m) for **<Automation: iLock>**. This mode is automatically deactivated when the instrument is turned off.
	S-Range Always On	Short Range Mode is permanently turned on.
<Target View:>	Choicelist	Available only for **<Automation: iLock>**. Reduces the Aim field of view to the central area of interest.
	Off	The Aim field of view is not reduced.
	On	The Aim field of view is reduced. This mode is automatically deactivated when the instrument is turned off.
	Always On	The Aim field of view is permanently reduced.

Next step

IF EDM	THEN
is not to be tested	**CONT (F1)** closes the screen and returns to **R9 Main Menu**.
is to be tested	**TEST (F4)** to test the EDM signal strength and frequency.

16.2 Search Windows

Description

- The settings on this screen define the size of search windows for prisms to be searched in. The prisms can be searched with iLock in the Aim window.
- Refer to "29.2 Prism Search Methods" for additional information.

Access

Select **Main Menu: Config...\Instrument Settings...\Search Windows**.

OR

Press **USER**.

Refer to "2 USER Key" for information on the **USER** key.

OR

Within the configuration set wizard.

Refer to "11.2 Accessing Configuration Set Management".

CONFIGURE
Search Windows, iLock Window page

CONT (F1)
To accept changes and return to **R9 Main Menu**.

DEFLT (F5)
To recall the default iLock window settings.

PAGE (F6)
To change to other page on screen.

Description of fields

Field	Option	Description
<Hz Search:>	User input	Horizontal extent of window.

Field	Option	Description
		This field is disabled when **<Target View: On>** or **<Target View: Always On>**. **<Target view active>** is displayed at the bottom on this page when the field is disabled.
<V Search:>	User input	Vertical extent of window. This field is disabled when **<Target View: On>** or **<Target View: Always On>**. **<Target view active>** is displayed at the bottom on this page when the field is disabled.

Next step
CONT (F1) returns to **R9 Main Menu**.

16.3 Automatic Prism Search

Description

- The settings on this screen define the behaviour of automatic prism search after the target is lost in lock mode.
- Refer to "29 Functions" for information on iLock, lock and automation behaviour.

Access

Select **Main Menu: Config...\Instrument Settings...\Automatic Prism Search**.

OR

Press **USER**.

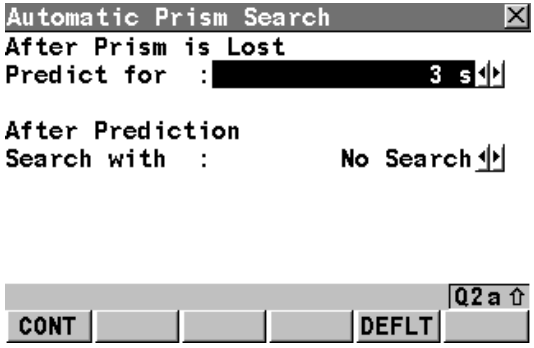
Refer to "2 USER Key" for information on the **USER** key.

OR

Within the configuration set wizard.

Refer to "11.2 Accessing Configuration Set Management".

CONFIGURE
Automatic Prism Search



CONT (F1)
To accept changes and return to **R9 Main Menu**.

DEFLT (F5)
To recall the default settings.

Description of fields

Field	Option	Description
<Predict for:>	From **1 s** to **5 s**	If the target is lost when **<Automation: Robotic>** the path of the reflector is predicted for the selected amount of seconds.
<Search with:>	**No Search**	Perform no search after prediction.
	iLock	Perform search after prediction with iLock in a dynamic iLock window.
	Last Point	If the target is lost when **<Automation: Robotic>**, then the instrument turns back to the last stored point. The field of view is disabled while the instrument is repositioning.

Next step
CONT (F1) closes the screen and returns to **R9 Main Menu**.

16.4 TPS Corrections

Description

- The settings on this screen define the atmospheric ppm, the geometric ppm and the refraction. The geometric ppm can also be determined by a resection calculation.
- For standard application programs the distance is corrected on account of atmospheric influences. The geometrical correction and the projection distortions are set to 0.00. Heights are reduced with the standard refraction coefficient.
- Refer to R9 User Manual for information on calculations.

Access

Select **Main Menu: Config...\Instrument Settings...\TPS Corrections**.

OR

Press **USER**.

Refer to "2 USER Key" for information on the **USER** key.

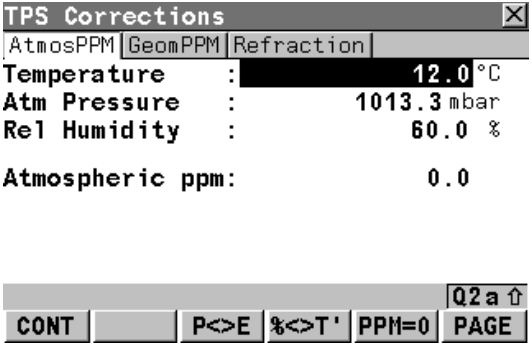
OR

Within the configuration set wizard.

Refer to "11.2 Accessing Configuration Set Management".

CONFIGURE
TPS Corrections, AtmosPPM page

The atmospheric distance corrections are derived from the dry air temperature, air pressure or elevation above mean sea level MSL and relative air humidity or wet bulb temperature.



CONT (F1)
To accept changes and return to **R9 Main Menu**.

P<>E (F3)
To change **<Atm Pressure:>** to **<Elev above MSL:>** and back.

%<>T ' (F4)
To change **<Rel Humidity:>** to **<Temp Wet-bulb:>** and back.

PPM=0 (F5)
To set **<Atmospheric ppm: 0.0>**.

PAGE (F6)
To change to other page on screen.

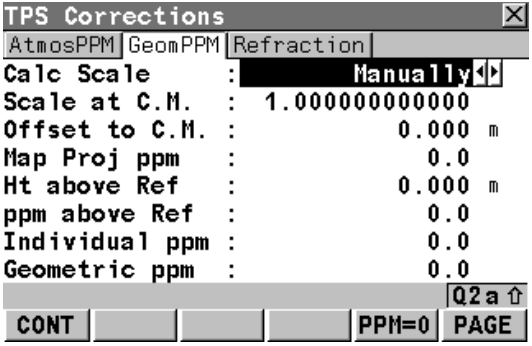
Description of fields

Field	Option	Description
<Temperature:>	User input	Sets the temperature.
<Atm Pressure:> or **<Elev above MSL:>**	User input	Sets the atmospheric pressure or the elevation above mean sea level dependent on selection.
<Rel Humidity:> or **<Temp Wet-bulb:>**	User input	Sets the relative air humidity or the wet bulb temperature dependent on selection.
<Atmospheric ppm:>	User input or Output	The atmospheric ppm is either set or calculated from the above values.

Next step
PAGE (F6) changes to the **GeomPPM** page.

CONFIGURE
TPS Corrections,
GeomPPM page

- The geometric distance correction (geometric ppm) is derived from the map projection distortion (map projection ppm), the height above reference datum correction (height ppm) and an individual correction (individual ppm).
- The calculation of the map projection ppm follows the formula for the Transversal Mercator Projection. The individual factors are: the scale factor of the line of projection central meridian, Gauss-Krüger = 1.0, UTM = 0.9996, etc. and the offset from the line of projection.
- The calculation of the height ppm is derived from the height of the instrument station above the reference datum. Normally this is the height above mean sea level MSL.



CONT (F1)
To accept changes and return to **R9 Main Menu**.

PPM=0 (F5)
To set **<Geometric ppm: 0.0>**.
Only available when **<Calc Scale: Manually>**.

PAGE (F6)
To change to other page on screen.

Description of fields

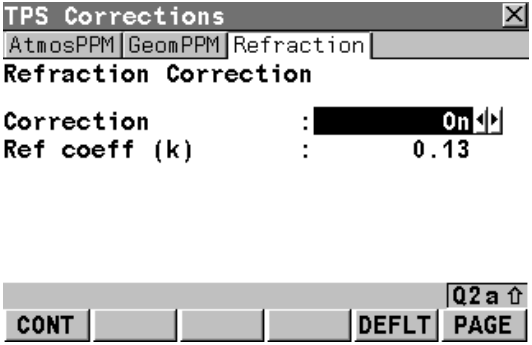
Field	Option	Description
<Calc Scale:>	**Manually**	The geometric ppm value is manually calculated.
<Scale at C.M.:>	User input	The scale at the central meridian.
<Offset to C.M.:>	User input	The offset to the central meridian.
<Map Proj ppm:>	Output	The map projection ppm value. If this value cannot be calculated, then **-----** is displayed and is also ignored in the calculation of the geometric ppm value.
<Ht above Ref:>	User input	The height of the instrument station above the reference datum.
<ppm above Ref:>	Output	The height ppm value calculated from **<Ht above Ref:>**.
<Individual ppm:>	User input	The individual ppm value.
<Geometric ppm:>	Output	**Geometric ppm** = **Map Proj ppm** + **ppm above Ref** + **Individual ppm**.

Next step

PAGE (F6) changes to the **Refraction** page.

CONFIGURE TPS Corrections, Refraction page

The refraction correction is taken into account during the calculation of the height difference. Refer to R9 User Manual for information on refraction calculation.



CONT (F1)
To accept changes and return to **R9 Main Menu**.

DEFLT (F5)
Sets **<Correction: On>** and **<Ref coeff (k): 0.13>**.

PAGE (F6)
To change to other page on screen.

Description of fields

Field	Option	Description
<Correction:>	**On** or **Off**	Refraction correction is applied to measurements.
<Ref coeff (k):>	User input	Available if **<Correction: On>**. Refraction coefficient to be used for calculation.

Next step

CONT (F1) returns to the screen from where **CONFIGURE TPS Corrections** was accessed.

16.5 Compensator

Description

The compensator and the Hz correction can be deactivated if raw data is to be displayed and recorded.

Access

Select **Main Menu: Config...\Instrument Settings...\Compensator.**

OR

Press **USER**.

Refer to "2 USER Key" for information on the **USER** key.

OR

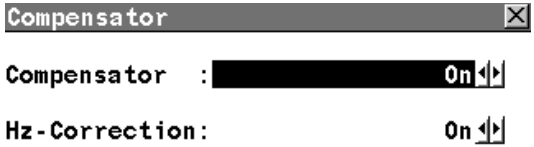
Within the configuration set wizard.

Refer to "11.2 Accessing Configuration Set Management".

OR

ICONS.

CONFIGURE Compensator



CONT (F1)

To accept changes and return to **R9 Main Menu**.

Description of fields

Field	Option	Description
<Compensator:>	**On**	Vertical angles are relative to plumb line. The horizontal angle is corrected for the transversal tilt errors if **<Hz-Correction: On>**.
	Off	Vertical angles are relative to vertical/standing axis.
<Hz-Correction:>	**On**	The horizontal angles are corrected for the line of sight, tilting axis and if **<Compensator: On>** transversal tilt errors.
	Off	Horizontal angles are not corrected.

Next step
CONT (F1) returns to **R9 Main Menu**.

16.6 Instrument ID

Description

- The settings on this screen define the instrument identification number. This number is used for the generation of the file names.
- Using format files, the instrument ID can be output together with data from the instrument. By doing so, it can be identified which instrument was used for certain measurements.

Access

Select **Main Menu: Config...\Instrument Settings...\Instrument ID**.

CONFIGURE Instrument ID

CONT (F1)
To accept changes and return to **R9 Main Menu**.

DEFLT (F5)
To recall the default instrument ID.

Description of fields

Field	Option	Description
<Instrument ID:>	User input	Sets a four digit number as instrument identification number. By default the last four numbers of the serial number are used.

Next step
CONT (F1) returns to **R9 Main Menu**.

16.7 Telescope Accessories

Description

The settings on this screen offer the possibility to limit the motorization to a certain part of the horizontal and/or vertical circle as used telescope and lens accessories may obstruct a full rotation of the telescope. General positioning functions are then restricted to these boundaries.

Access

Select **Main Menu: Config...\Instrument Settings...\Telescope Accessories**.

CONFIGURE Telescope Accessories, Hz Limit page

CONT (F1)
To accept changes and return to **R9 Main Menu**.

NEW (F2)
To define new horizontal limits for instrument rotation.

SHOW (F5)
To define new horizontal limits for instrument rotation.

Description of fields

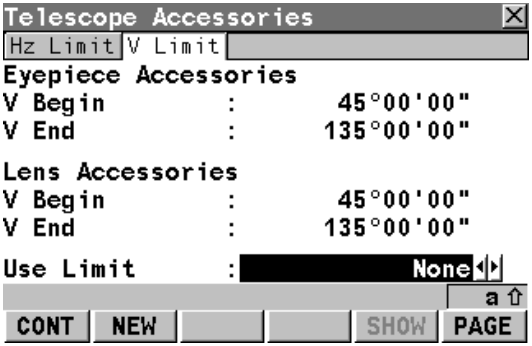
Field	Option	Description
<Hz Begin:> **<Hz End:>**	Output/User input	The boundaries of the window within the instrument is allowed to turn.
<Use Limit:>	**Yes**	Instrument turning is restricted to the defined window.

Field	Option	Description
	No	Instrument rotates without any limitation, from 0 to 400 gon.

Next step

PAGE (F6) returns to the **V Limit** page.

CONFIGURE
Telescope Accessories, V Limit page



CONT (F1)
To accept changes and return to **R9 Main Menu**.

NEW (F2)
To define new vertical limits for telescope rotation.

SHOW (F5)
To position the telescope to its rotation limits.

Description of fields

Field	Option	Description
<V Begin:> **<V End:>**	Output/User input	Vertical extent of the window in which the instrument is allowed to turn the telescope. The value of the current limit refers to the vertical reading of the present line of sight direction.

Field	Option	Description
<Use Limit:>	**None**	Telescope turns without any limitation from 0 to 400 gon.
	Eyepiece	The movement of the telescope is limited by the stored Eyepiece Accessories Limits.
	Lens	The movement of the telescope is limited by the stored Lens Accessories Limits.
	Eyepce & Lens	The movement of the telescope is limited by the combination of both areas with the least vertical extend.

Next step
CONT (F1) returns to **R9 Main Menu**.

17 Config...\General Settings...

17.1 Units & Formats

Description

The settings on this screen define

- the units for all types of measurement data displayed.
- information related to some types of measurement data.
- the order in which coordinates are displayed.

Access

Select **Main Menu: Config...\General Settings...\Units & Formats**.

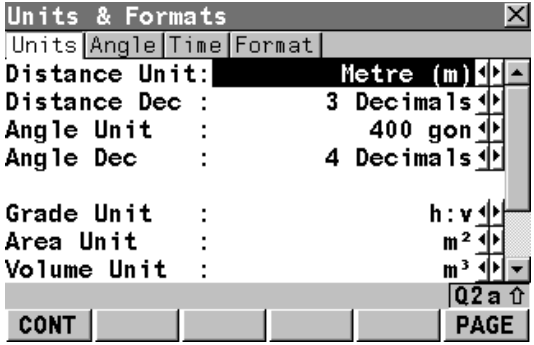
OR

Press **USER**. Refer to "2 USER Key" for information on the **USER** key.

OR

Within the configuration set wizard. Refer to "11.2 Accessing Configuration Set Management".

CONFIGURE
Units & Formats,
Units page



CONT (F1)
To accept changes and return to the screen from where this screen was accessed.

PAGE (F6)
To change to another page on this screen.

Description of fields

Field	Option	Description
<Distance Unit:>		The units shown for all distance and coordinate related fields.
	Metre (m)	Metres [m]
	Int Ft (fi)	International feet [fi], storage in US feet
	Int Ft/Inch (fi)	International feet [fi], inches and 1/8 inches (0' 00 0/8 fi), storage in US feet
	US Ft (ft)	US feet [ft]
	US Ft/Inch (ft)	US feet, inches and 1/8 inches (0' 00 0/8 fi) [ft]

Field	Option	Description
<Distance Dec:>	From **0 Decimal** to **4 Decimals**	The number of decimal places shown for all distance and coordinate related fields. This is for data display and does not apply to data export or storage. The available options depend on the selected **<Distance Unit:>**.
<Angle Unit:>	**400 gon**, **360 ° ' "**, **360° dec** or **6400 mil**	The units shown for all angular and coordinate related fields. More angle settings can be defined on the **Angle** page.
<Angle Dec:>		The number of decimal places shown for all angular and coordinate related fields. This is for data display and does not apply to data export or storage.
	From **2 Decimals** to **4 Decimals**	Available for **<Angle Unit: 400 gon>** or **<Angle Unit: 360° dec>**.
	From **1 Decimal** to **3 Decimals**	Available for **<Angle Unit: 6400 mil>**.
	0.1”, 1”, 5”, 10”, 60”	Available for **<Angle Unit: 360 ° ’ ”>**.
<Grade Unit:>		The input and output format for grades.
	h:v	Horizontal by vertical distance.
	v:h	Vertical by horizontal distance.
	% (v/h * 100)	Percentage of vertical by horizontal distance.
	Elev Angle	Elevation angle.

Field	Option	Description
<Area Unit:>	**m^2**, **Int Acres (Ai)**, **US Acres (A)**, **Hectares (ha)**, **fi^2** or **ft^2**	The units shown for all area related fields.
<Volume Unit:>	**m^3**, **fi^3**, **ft^3** or **yd^3**	The units shown for all volume related fields.
<Temp Unit:>	**Celsius (°C)** or **Fahrenheit (°F)**	The units shown for all temperature related fields.
<Press Unit:>	**mbar**, **mmHg**, **Inch Hg (inHg)**, **hPa** or **psi**	The units shown for all pressure related fields. psi = pounds per square inch.

Next step

PAGE (F6) changes to the **Angle** page. Refer to paragraph "CONFIGURE Units & Formats, Angle page".

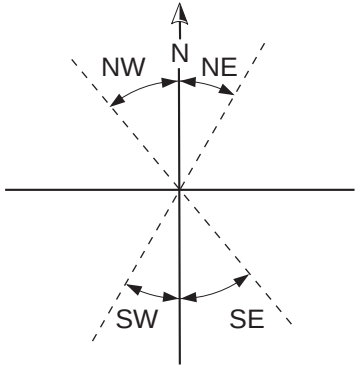
CONFIGURE
Units & Formats,
Angle page

CONT (F1)
To accept changes and return to the screen from where this screen was accessed.

PAGE (F6)
To change to another page on this screen.

Description of fields

Field	Option	Description
<Direc Ref:>	**North Azimuth**, **South Azimuth**, **North Anti-clock**, or **Bearing**	Sets the reference direction as well as the direction from where and how azimuths are computed. For **<Direc Ref: Bearing>**, the azimuth/bearing fields in other screens are called **<Bearing:>**. NE, SW, SE and NW indicate the quadrant of the bearing.

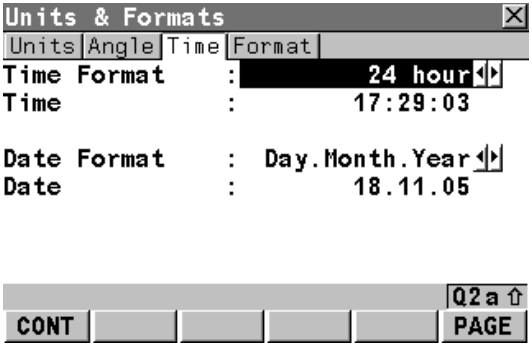
Field	Option	Description
		 For all other options, the azimuth/bearing fields in other screens are called **<Azimuth:>**.
<V-Display:>	**Zenith Angle**	V = 0 in zenith.
	Elev Angle	V = 0 horizontal elevation angle. V-angles are positive above the horizon and negative below it.
	Elev Angle %	V = 0 horizontal. V-angles are expressed in % and are positive above the horizon and negative below it.
<V-Angle:>	**Hold after DIST**	The vertical angle is fixed after a distance measurement with **DIST (F2)**, whereas the horizontal angle is continuously updated with the telescope movement.

Field	Option	Description
	Running	The vertical angle is continuously updated with the telescope movement. ☞ The active reflector height is applied in the calculation of remote point elevations. The reflector height must be set to zero to display and record the elevation of the targeted remote point.

Next step

PAGE (F6) changes to the **Time** page. Refer to paragraph "CONFIGURE Units & Formats, Time page".

CONFIGURE Units & Formats, Time page



CONT (F1)
To accept changes and return to the screen from where this screen was accessed.

PAGE (F6)
To change to another page on this screen.

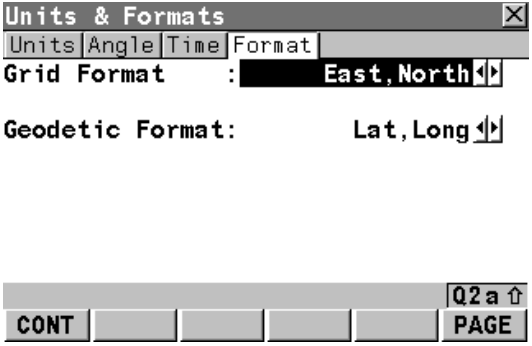
Description of fields

Field	Option	Description
<Time Format:>	**24 hour** or **12 hour (am/pm)**	How the time is shown in all time related fields.
<Date Format:>	**Day.Month.Year**, **Month/Day/Year** or **Year/Month/Day**	How the date is shown in all date related fields.

Next step

PAGE (F6) changes to the **Format** page. Refer to paragraph "CONFIGURE Units & Formats, Format page".

CONFIGURE Units & Formats, Format page



CONT (F1)
To accept changes and return to the screen from where this screen was accessed.

PAGE (F6)
To change to another page on this screen.

Description of fields

Field	Option	Description
<Grid Format:>	**East,North** or **North,East**	The order in which grid coordinates are shown in all screens. The order in display masks depends on the user settings.
<Geodetic Format:>	**Lat,Long** or **Long,Lat**	The order in which geodetic coordinates are shown in all screens. The order in display masks depends on the user settings.

Next step

PAGE (F6) changes to the first page on this screen.

17.2 Wizard Mode

Description

The settings on this screen define the behaviour of the configuration set wizard.

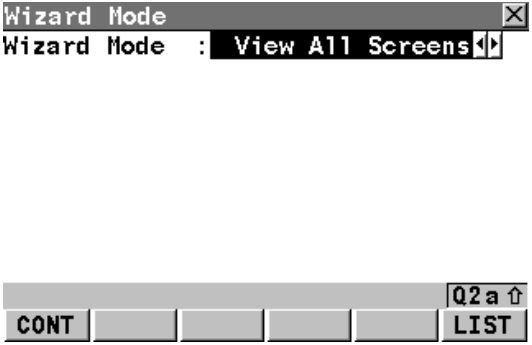
Access

Select **Main Menu: Config...\General Settings...\Wizard Mode**.

OR

Within the configuration set wizard. Refer to "11.2 Accessing Configuration Set Management".

CONFIGURE Wizard Mode



CONT (F1)
To accept changes and to return to **R9 Main Menu** or to continue with the subsequent screen within the configuration set wizard.

LIST (F6)
To access **CONFIGURE Quick Access**. Lists all screens within a configuration set. Allows to access these individual screens and change settings.

Description of fields

Field	Option	Description
<Wizard Mode:>	**View All Screens**	All configuration screens are shown in the configuration set wizard. Application program configuration screens are not included. They can be configured within each application program.

Field	Option	Description
	Reduced	A reduced set of screens are shown in the configuration set wizard.

Next step

CONT (F1) returns to **R9 Main Menu** or continues with the subsequent screen within the configuration set wizard.

17.3 User Menu

Description

The settings on this screen assign a particular function, screen or application program to the **USER** key. Refer to "2 USER Key" for more information on the **USER** key.

Access

Select **Main Menu: Config...\General Settings...\User Menu**.

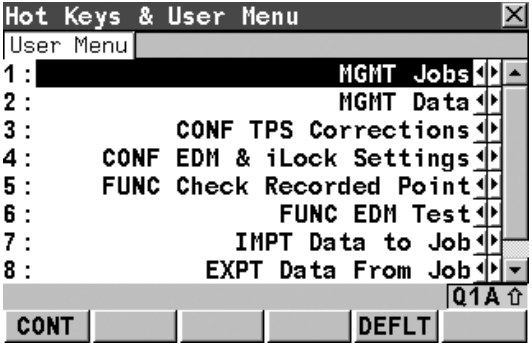
OR

Press **USER**. Refer to "2 USER Key" for information on the **USER** key.

OR

Within the configuration set wizard. Refer to "11.2 Accessing Configuration Set Management".

CONFIGURE User Menu, User Menu page


Hot Keys & User Menu
User Menu
1 : MGMT Jobs
2 : MGMT Data
3 : CONF TPS Corrections
4 : CONF EDM & iLock Settings
5 : FUNC Check Recorded Point
6 : FUNC EDM Test
7 : IMPT Data to Job
8 : EXPT Data From Job
Q1A
CONT
DEFLT

CONT (F1)
To accept changes and return to the screen from where this screen was accessed.

PAGE (F6)
To change to another page on this screen.

Description of fields

Field	Option	Description
<1:> to **<9:>**	Choicelist	All functions, screens or application programs which can be assigned to the individual lines in the user defined menu.

Next step
PAGE (F6) changes to the first page on this screen.

17.4 Language

Description

The setting on this screen defines the language used on the instrument. Three languages can be stored on the instrument at one time - English and two others. English cannot be deleted. Refer to "23.2 System Languages".

Access

Select **Main Menu: Config...\General Settings...\Language**.

CONFIGURE Languages on Instrument

CONT (F1)
To accept changes and return to **R9 Main Menu**.

DEL (F4)
To delete the highlighted language.

Description of fields

Column	Option	Description
<Language:>	Choicelist	Sets the language. The selected language is used for the system software. If a language is not available for the system software, the English language is used instead. Application programs run in the language they were loaded.

Next step

CONT (F1) returns to **R9 Main Menu**.

17.5 Lights, Display, Beeps, Text

Description

The settings on this screen allow the lights and screen appearance to be configured, turn the notification beeps on and off and define the behaviour of the keys.

Access

Select **Main Menu: Config...\General Settings...\Lights, Display, Beeps, Text**.

OR

Press **SHIFT F11**.

CONFIGURE
Lights, Display, Beeps, Text,
Lights page

CONT (F1)
To accept changes and return to **R9 Main Menu**.

PAGE (F6)
To change to another page on this screen.

Description of fields

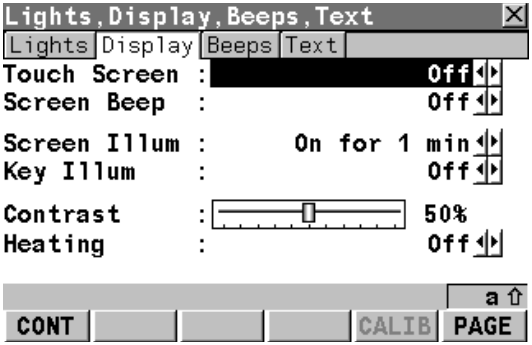
Field	Option	Description
<Redlaser:>	**On** or **Off**	To turn the redlaser of RL EDM on and off.
<SureBeam:>	**On** or **Off**	To turn the Laser Guide (GUS74) on and off. This field is only available if GUS74 is fitted
<Intensity:>	From **0 %** to **100 %**	To adjust the SureBeam/Laser Guide intensity using the left and right arrow keys.
<Reticule:>	**On** or **Off**	To turn the reticule illumination on and off.
<Intensity:>	From **0 %** to **100 %**	To adjust the reticule illumination intensity using the left and right arrow keys.

Next step

PAGE (F6) changes to the **Display** page.

CONFIGURE
Lights, Display, Beeps, Text,
Display page

This page contains the screen display settings for the R9 instrument.



CONT (F1)
To accept changes and return to the screen from where this screen was accessed.

CALIB (F5)
To calibrate the touch screen.

PAGE (F6)
To change to another page on this screen.

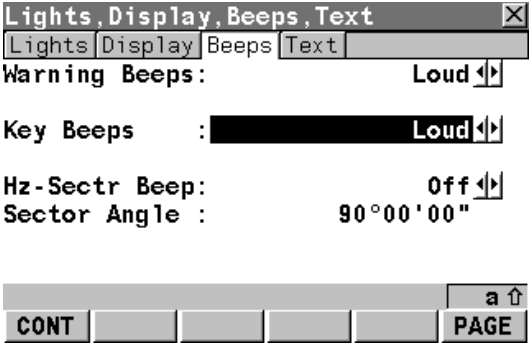
Description of fields

Field	Option	Description
<Touch Screen:>	**On** or **Off**	Turns touch screen on and off.
<Screen Beep:>	**Off**, **Soft** or **Loud**	Controls the beep upon touching the touch screen.
<Screen Illum:>	**Always On**, **On for 1 min**, **On for 2 min**, **On for 5 min**	Controls the screen illumination to be on, or on for the specified time after the last key was pressed.

Field	Option	Description
<Key Illum:>	**Off**, **Same as Screen** or **Always On**	Controls the keyboard illumination.
<Contrast:>	From **0 %** to **100 %**	To adjust the screen brightness.
<Heating:>	**Off** or **Auto-matic**	Turns screen heating on and off.

Next step
PAGE (F6) changes to the **Beeps** page.

CONFIGURE
Lights, Display, Beeps, Text,
Beeps page



CONT (F1)
To accept changes and return to the screen from where this screen was accessed.

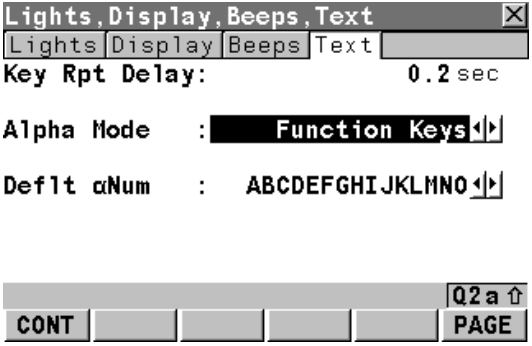
PAGE (F6)
To change to another page on this screen.

Description of fields

Field	Option	Description
<Warning Beeps:>	**Off**, **Soft** or **Loud**	Controls the beep for acoustic warning signals for the R9 instrument.
<Key Beeps:>	**Off**, **Soft** or **Loud**	Controls the beep upon key presses for the R9 instrument.
<Hz-Sectr Beep:>	**On** or **Off**	Turns the Hz-sector beep on and off. The instrument beeps when within 5 gon/4°30’ of the defined sector, there is a long and consistent beep within 0.5 gon/27’ and no beep within 0.005 gon/16’’.
<Sector Angle:>	User input	Input field for sector angle for which a beep should sound.

Next step
PAGE (F6) changes to the **Text** page.

CONFIGURE
Lights, Display, Beeps, Text,
Text page



CONT (F1)
To accept changes and return to the screen from where this screen was accessed.

PAGE (F6)
To change to another page on this screen.

Description of fields

Field	Option	Description
<Key Rpt Delay:>	User input	Key repeat delay is the time between the initial key press and when the key starts repeating. For example in numeric mode press and hold 1. Behaviour on screen: 1 - delay - 1111111111. In alpha mode the focus stays on one field and scrolls through the available characters: S - delay - T U 7 S T U 7. Time between the initial key press and when the key starts repeating. Alphanumeric, numeric, **CE** or arrow keys in all general screens are delayed by the specified time.

Field	Option	Description
<Alpha Mode:>	**Function Keys** or **Numeric Keys**	Alphanumeric input can either be through function or numeric keys.
<Deflt αNum:>	Up to 6 choices	Available if **<Alpha Mode: Function Keys>**. Sets the set of extra characters available through **αNUM** or on **F1**-**F6** whenever an entry is made. The choices available depend on the character sets loaded on the instrument and the language configured to be used on the instrument.

Next step

PAGE (F6) changes to the next page.

17.6 Start Up & Power Down

Description

- The settings on this screen
  - define the instrument start up screen.
  - define the behaviour of the instrument when starting up and when powering down.
  - define a PIN code which needs to be entered when starting up the instrument.

Start Up

- The screen entered after turning on the instrument can be configured.

Power Down

- Once power is restored after a power loss the instrument returns to the screen in which it was operating when the power failed. After restarting, the instrument uses the same job and configuration set as before the power loss. If either the job or configuration set are not available the first in the list is used.
- Two types of power loss could be experienced:
  - Sudden power loss: Internal or external battery being removed
  - Gradual power loss: Internal or external battery running down naturally

PIN Code

- A **P**ersonal **I**dentification **N**umber protection can be activated.

Type	Description
PIN protection active	Instrument prompts for PIN code entry • after starting up.

Type	Description
	• when changing the PIN code in **CONFIGURE Start Up & Power Down**.
PIN code generation	By the user.
Attempts for correct PIN code	Five. After five false attempts, a **P**ersonal **U**nbloc**K**ing code must be typed in.
PUK code generation	• By Stonex®.

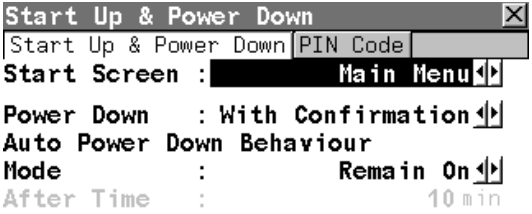
Access

Select **Main Menu: Config...\General Settings...\Start Up & Power Down**.

OR

Within the configuration set wizard. Refer to "11.2 Accessing Configuration Set Management".

CONFIGURE Start Up & Power Down Start Up & Power Down page



CONT (F1)

To accept changes and return to **R9 Main Menu**.

Description of fields

Field	Option	Description
<Start Screen:>	Choicelist	Determines the first screen which is shown after turning on the instrument.
<Power Down:>		Sets the behaviour of the instrument shut down.
	With Confirmation	Instrument shut down must be confirmed.
	Directly	The instrument is shut down immediately without confirmation.
<Mode:>	**Turn Off**	The instrument turns off if no events have occurred after the time set in **<After Time:>**.
	Remain On	The instrument does not power down automatically.
<After Time:>	User input	Available unless **<Mode: Remain On>** is selected. Minutes after which the instrument should turn off.

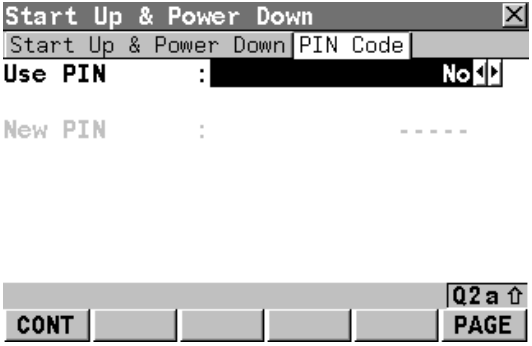
Next step
PAGE (F6) changes to the **PIN Code** page.

CONFIGURE
Start Up & Power Down, PIN Code page

The appearance of the screen varies with the setting for **<Use PIN:>** when this screen is accessed.

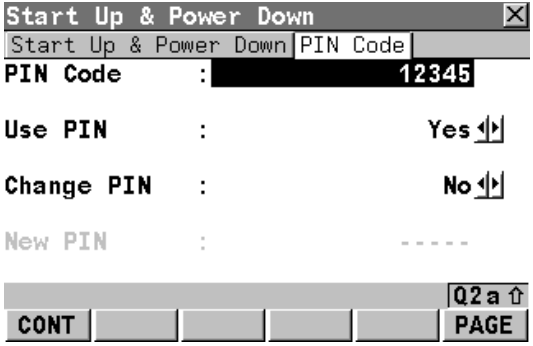
<Use PIN: No>
No PIN code has been set before.

- The PIN code protection can be activated.
- Then a PIN code can be typed in.



<Use PIN: Yes>
A PIN code has been set before.

- The PIN code must be typed in order to change settings on this page.
- Then the PIN code protection can be deactivated.
- Or the PIN code can be changed.



Description of fields

Field	Option	Description
<Use PIN:>	**Yes** or **No**	Activates the PIN code protection. This setting is not part of the configuration set.
<New PIN:>	User input	The PIN code must be a number with four to six digits.
<PIN Code:>	User input	The PIN code as previously defined on this page. The correct PIN code must be typed in within five attempts or the PUK code is required. Refer to "1 Instrument Protection with PIN".
<Change PIN:>	**Yes** or **No**	Activates **<New PIN:>** to type in a new PIN code.

Next step

PAGE (F6) changes to the first page on this screen.

18 Interfaces, Ports, Devices

18.1 Overall Concept

Terminology

Term	Description
Interface	The procedures, codes and protocols that enable two entities to interact for an exchange of data. Each interface is given a meaningful display name which enables easy distinction between interfaces.
Port	A connection through which a separate device may communicate with the instrument.
Device	The hardware which is connected to the chosen port.

Concept

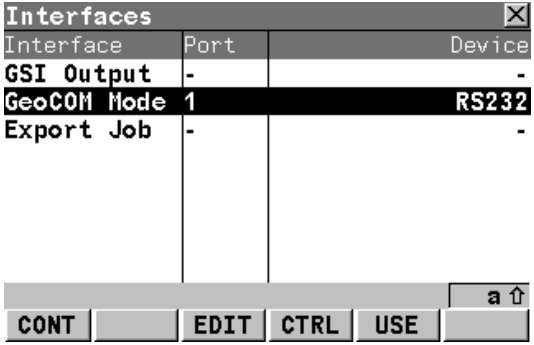
Table

This table gives an overview of the interaction between an interface, port and device.

Concept		Example
Interface	What type of information is to be communicated between the instrument and device?	GeoCom Mode
Port	Which port is being used to connect the device to the instrument ?	Port 2(Handle)
Device	Which device is being connected to the port and what are its communication settings and individual parameters ?	Baud Rate: 115200 Parity: None Data Bits: 8 Stop Bit: 1 Link Number: 1, Set as: Base

Screen

This screen gives an overview of all interfaces with the currently assigned port and device.

Point	Description
1.	 • **CONFIGURE Interfaces - EDIT (F3)** refers to **interface parameters**. To configure the parameters related to the highlighted interface (switching on/off the interface, port selection, device selection and device communication settings). • **CONFIGURE Interfaces - CTRL (F4)** refers to **device parameters**. To configure additional parameters related to the highlighted device. • **CONFIGURE Interfaces - USE (F5)** enables the immediate turning on/off of an interface, without the need for editing/configuring. The last used settings are automatically recalled.
2.	One port can only connect to one device at a time.
3.	One port may be used by more than one interface at a time.

Further information

IF more information is required on	THEN
interfaces	Refer to "18.2 Interfaces"
ports	Refer to "18.3 Ports"
devices	Refer to "18.4 Devices"
EDIT (F3) interface parameters	Refer to "19 Config...\Interfaces... - Editing The Interface"
CTRL (F4) device parameters	Refer to "20 Config...\Interfaces... - Controlling The Device"

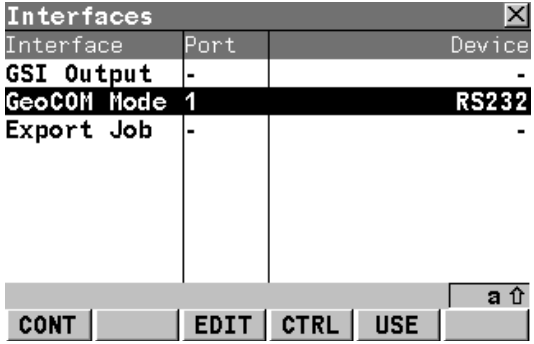
18.2 Interfaces

18.2.1 Overview of Interfaces

Description

The instrument has various interfaces configured to be used with a port and a device. The configuration varies depending on the individual application.

Available interfaces



18.2.2 Accessing CONFIGURE Interfaces

Access

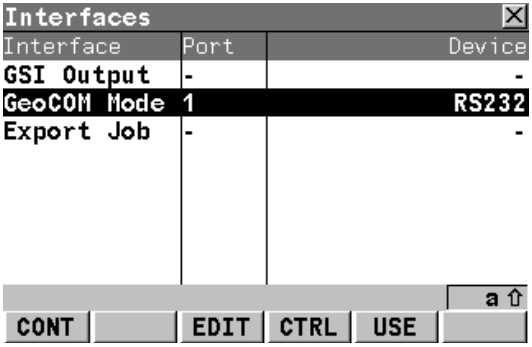
Select **Main Menu: Config...\Interfaces....**

OR

Press **USER**. Refer to "2 USER Key" for information on the **USER** key.

CONFIGURE Interfaces

The screen gives an overview of all interfaces with the currently assigned port and device.



CONT (F1)
To return to the screen from where this screen was accessed.

EDIT (F3)
To configure the parameters related to the highlighted interface.

CTRL (F4)
Available for certain devices connected to certain interfaces. To configure additional paramaters.

USE (F5)
To turn the highlighted interface on or off. If the interface is turned on then the settings which were last used with that interface are active. If the device which was last used with that interface is no longer available, the RS232 is assigned to that interface.

Next step

IF	THEN
an interface is to be turned on/off, a port is to be selected or a device is to be selected	Highlight the interface and **EDIT (F3)**. Refer to "19 Config...\Interfaces... - Editing The Interface"
a device attached to an interface is to be configured	Highlight the relevant interface and **CTRL (F4)**. Refer to "20 Config...\Interfaces... - Controlling The Device"
an interface is to be turned on/off	Highlight the relevant interface and **USE (F5)**.

18.3 Ports

Description

- The instrument is always fitted with the port located at the instrument base (port 1). Additional ports are available for RH9 (port 2) and for Bluetooth (port 3).
- The list of available devices always depends on the selected port.

Available ports

Type

Port	R9
Port 1	For power and/or communication, 5 pin LEMO-0
Port 2 (Handle)	Hotshoe connection for RH9
Port 3 (BT)	Bluetooth module for communication with Bluetooth capable devices

Location

Port	Description
Port 1	This port is located at the base of the instrument and is always available.
Port 2 (Handle)	This port is located on top of the Communication side cover.
Port 3 (BT)	This port is housed within the Communication side cover.

18.4 Devices

18.4.1 Overview of Devices

Description

- A device is the hardware which is connected to the chosen port. Devices are used to transmit and receive measurement data.
- Before using any device with R9 it is necessary to configure the interface with which it will be used. Refer to "19 Config...\Interfaces... - Editing The Interface" for information on how to configure interfaces.
- Some devices may be used with different interfaces for different applications.

Further information

IF more information is required on	THEN
radios for remote control	Refer to "18.4.5 Device - Radios for Remote Control".
RS232	Refer to "18.4.6 Device - RS232".

18.4.2 Accessing CONFIGURE Devices

Description

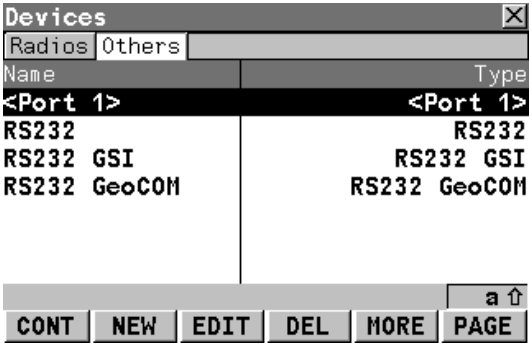
- Allows devices to be created, edited, selected and deleted.
- Refer to "20 Config...\Interfaces... - Controlling The Device" for more information.

Access step-by-step

Step	Description
1.	**Main Menu: Config...\Interfaces...**
2.	Highlight the appropriate interface based on the type of device that needs to be configured.
3.	**EDIT (F3)** to access **CONFIGURE XX**.
4.	**DEVCE (F5)** to access **CONFIGURE Devices**. Refer to paragraph "CONFIGURE Devices".

CONFIGURE
Devices

This screen consists of two pages. The functionality described below is always the same.



CONT (F1)
To select the highlighted device and return to the screen from where this screen was accessed.

NEW (F2)
To create a new device. Refer to "18.4.3 Creating a New Device".

EDIT (F3)
To edit the highlighted device. Refer to "18.4.4 Editing a Device".

DEL (F4)
To delete the highlighted device.

MORE (F5)
To display information about the type of device and the creator of the device.

PAGE (F6)
To change to another page on this screen.

SHIFT DEFLT (F5)
To recall previously deleted default devices and to reset default devices to the default settings.

Description of columns

Column	Description
Name	Names of available devices.
Type	Type of device defined when creating the device.
Creator	The creator of the device. The creator can either be **Default** if the device is a default, or **User** if the device has been created. ☞ If a **Default** device is edited by using **EDIT (F3)** then its creator is still displayed as **Default**.

Next step

IF the desired device is	THEN
present in the list	highlight the desired device. **CONT (F1)** to close the screen and to return to the screen from where **CONFIGURE Devices** was accessed.
is not present in the list	**NEW (F2)**. Refer to "18.4.3 Creating a New Device".
is present in the list but needs to be edited	highlight the desired device. **EDIT (F3)**. Refer to "18.4.4 Editing a Device".

18.4.3 Creating a New Device

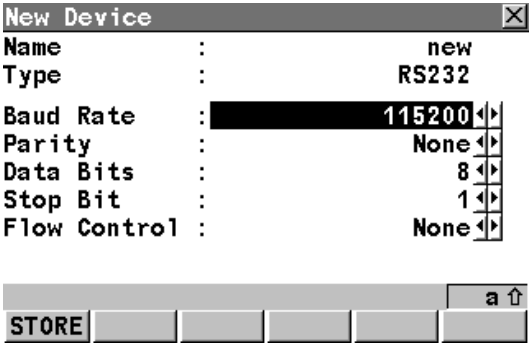
Description

Allows a new device to be configured.

Access step-by-step

Step	Description
1.	Refer to "18.4.2 Accessing CONFIGURE Devices" to access **CONFIGURE Devices**.
2.	Highlight a device of the same type as the device to be created, from the list.
3.	**NEW (F2)** to access **CONFIGURE New Device**.

CONFIGURE New Device



STORE (F1)

To store the new device and to return to the screen from where this screen was accessed.

Description of fields

Field	Option	Description
<Name:>	User input	Name of new device.
<Type:>	Output	Same device type as was highlighted when **NEW (F2)** was used.
<Baud Rate:>	From **1200** to **115200**	Frequency of data transfer from instrument to device in bits per second.
<Parity:>	**None, Odd** or **Even**	Error checksum at the end of a block of digital data.
<Data Bits:>	**7** or **8**	Number of bits in a block of digital data.
<Stop Bits:>	**1** or **2**	Number of bits at the end of a block of digital data.
<Flow Control:>	**None** or **RTS/CTS**	Available for some devices. Activates hardware handshake. When the instrument/device is ready for data, it asserts the **R**equest **T**o **S**end line indicating it is ready to receive data. This is read by the sender at the **C**lear **T**o **S**end input, indicating it is clear to send the data.

Next step
STORE (F1) to close the screen and to return to the screen from where **CONFIGURE Device** was accessed.

18.4.4 Editing a Device

Access step-by-step

Step	Description
1.	Refer to "18.4.2 Accessing CONFIGURE Devices" to access **CONFIGURE Devices**.
2.	Highlight the device to be edited from the list.
3.	**EDIT (F3)** to access **CONFIGURE Edit Device**.

CONFIGURE Edit Device

The availability of options may change depending on the selected device. Most fields are identical with the creation of a new device. Refer to "18.4.3 Creating a New Device" for information on the fields.

Next step

STORE (F1) to close the screen and to return to the screen from where **CONFIGURE Edit Device** was accessed.

18.4.5 Device - Radios for Remote Control

Typical uses	To remote control the R9.
Supported radios	The radio used with R9 for remote control is the RH9. R9 has to be set to the correct communication mode to send and receive data and commands via the radio.
User defined radios	Other radios than the default radios can be used. Their settings must be defined by creating a new radio configuration. Refer to "18.4.3 Creating a New Device". These radios must be connected with a cable. Refer to "Appendix D Cables" for information on cables.

18.4.6 Device - RS232

Typical uses

- To exchange information with a device via an RS232 interface.
- RS232 GeoCOM can be used to control the instrument via GeoCOM commands.
- RS232 GSI can be used to send data from the instrument to a computer.
- Port 1 is used to connect to RS232 devices with a cable. Refer to "Appendix D Cables" for information on cables.

Example of use

Step	Description
1.	A device with an RS232 interface must be connected to the instrument.
2.	Information can be exchanged between the instrument and the device. For example measurement data can be continuously sent out from the instrument.
3.	A connection is maintained until the instrument is turned off, the configuration is changed or the device is detached.

Supported RS232

Default RS232 devices

- RS232
- RS232_GSI
- RS232_GeoCOM

User defined RS232

All settings can be defined.

19 Config...\Interfaces... - Editing The Interface

19.1 GSI Output

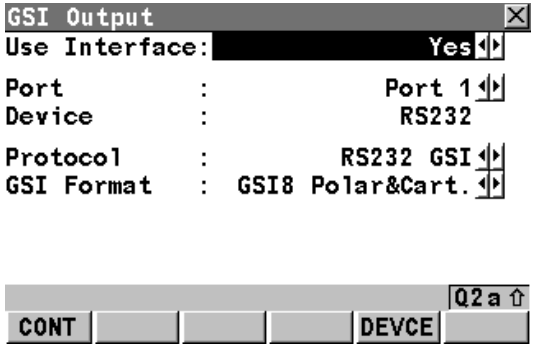
Description

Data is streamed through the serial port (RS232) and is stored to the active job. GSI data is stored when **<Use Interface: Yes>** and either **ALL (F1)** or **REC (F3)** is pressed. The format of the data depends on the option selected in **<Output Format:>**.

Access step-by-step

Step	Description
1.	Refer to "18.2.2 Accessing CONFIGURE Interfaces" to access **CONFIGURE Interfaces**
2.	**CONFIGURE Interfaces** Highlight **GSI Output**.
3.	**EDIT (F3)** to access **CONFIGURE GSI Output**.

CONFIGURE GSI Output



CONT (F1)
To accept changes and return to the screen from where this screen was accessed.

DEVCE (F5)
To create, select, edit or delete a device.

Description of fields

Field	Option	Description
<Use Interface:>	**Yes** or **No**	Activates the interface.
<Port:>	Output	This field is available when **<Use Interface: Yes>**. Port to be used.
<Device:>	Output	This field is available when **<Use Interface: Yes>**. Device to be used.
<Protocol:>		This field is available when **<Use Interface: Yes>**. Protocol defines if the system expects a handshake or no handshake.
	RS232 GSI	A handshake is required. A data block is sent out from the instrument and a receive confirmation is expected. This handshake requires that GeoCom Mode be activated.
	None	No handshake is required.
<GSI Format:>	Output	This field is available when **<Use Interface: Yes>**.
	GSI8 Polar&Cart.	GSI Polar and Cartesian (8 data characters) (Point ID, Hz, V, SlopeDist, PPM, E, N, Elev.)
	GSI16 Polar	GSI Polar (16 data characters) (Point ID, Hz, V, SlopeDist, PPM, reflector height)
	GSI16 Cartesian	GSI Cartesian (16 data characters) (E, N, Elev, Reflector Height)

Field	Option	Description
	Pt,N,E,Ht,Date	Coordinate data (Northing BEFORE Easting)
	Pt,E,N,Ht,Date	Coordinate data (Easting BEFORE Northing)
	Pseudo NMEA GGA	Based on NMEA (**N**ational **M**arine **E**lectronics **A**ssociation), which is a standard for interfacing marine electronic devices.
	GSI8 Polar	GSI Polar (8 data characters) (Point ID, Hz, V, SlopeDist, PPM)
	GSI16 Polar2	GSI Polar (16 data characters) (Point ID, Hz, V, SlopeDist, PPM)

Next step

IF a device is	THEN
not to be created or edited	**CONT (F1)** closes the screen and returns to the screen from where **CONFIGURE GSI Output** was accessed.
to be created or edited	**DEVCE (F5)** to create or edit a device.

Output format - GSI Format

GSI data is transmitted in blocks. Every block consists of several data words, refer to the examples below. Every data word begins with a two character Word Index, the WI code, specifying the data type within this block. Each GSI-8 word has in total 16 characters, consisting of 7 information characters followed by 8 data characters and by the blank character ASCII code 32 at the end of the data word. The GSI-16 block is similar to the GSI-8 block but the block begins with * and the data word contains 16 characters for large values such as UTM coordinates, large alphanumeric codes, attributes or point ID's.

Example 1 shows a GSI-8 block sequence with the words for point ID (11), Easting coordinate (81) and Northing coordinate (82). Example 2 shows a GSI-16 block sequence with the words for point ID (11), horizontal (21) and vertical angle (22).

There are no hardcoded GSI files available

Type	GSI8 Polar&Cart	GSI16 Polar	GSI16 Cartesian
WI 11	Point ID	Point ID	Point ID
WI 21	Azimuth	Azimuth	-
WI 22	V	V	-
WI 31	SlopeDist	SlopeDist	-
WI 51	PPM Total/mm	PPM Total/mm	-
WI 81	East	-	East
WI 82	North	-	North
WI 83	Elev.	-	Elev.
WI 87	Refl. Ht	-	Refl. Ht

Example 1: GSI8
Each word has 16 characters of which 8 characters are used for the data block.

Word 1	Word 2	Word 3
110001+0000A110	81..00+00005387	82..00-00000992
110002+0000A111	81..00+00007586	82..00-00003031
110003+0000A112	81..00+00007536	82..00-00003080
110004+0000A113	81..00+00003839	82..00-00003080
110005+0000A114	81..00+00001241	82..00-00001344

Example 2: GSI16
Each word has 24 characters of which 16 characters are used for the data block.

Word 1	Word 2	Word 3
*110001+000000000PNC0055	21.002+0000000013384650	22.002+0000000005371500
*110002+000000000PNC0056	21.002+0000000012802530	22.002+0000000005255000
*110003+000000000PNC0057	21.002+0000000011222360	22.002+0000000005433800
*110004+000000000PNC0058	21.002+0000000010573550	22.002+0000000005817600
*110005+000000000PNC0059	21.002+0000000009983610	22.002+0000000005171400

GSI Word information

Pos.	Name	Description of values	Applicable for
1-2	Word Index (WI)		

Pos.	Name	Description of values	Applicable for
3	No significance	.: No information.	WI 11, WI 21, WI 22, WI 31, WI 51, WI 81, WI 82, WI 83, WI 87
4	Automatic index information	.: No information. 0: **<Compensator: Off>** 3: **<Compensator: On>**	WI 21, WI 22
5	Input mode	.: No information. 0: Measured values transferred from instrument 1: Manual input from keyboard 2: Measured value, **<Hz-Correction: On>**. 3: Measured value, **<Hz-Correction: Off>**. 4: Result calculated from functions	WI 21, WI 22, WI 31, WI 51, WI 81, WI 82, WI 83, WI 87
6	Units	.: No information. 0: **<Distance Unit: Metre (m)>**, last digit 1 / 1000 m 1: **<Distance Unit: Us ft (ft)>,** last digit 1 / 1000 ft 2: **<Angle Unit: 400 gon>** 3: **<Angle Unit: 360 ° dec>** 4: **<Angle Unit: 360 ° ’ ’>**l 5: **<Angle Unit: 6400 mil>** 6: **<Distance Unit: Metre (m)>,** last digit 1 / 10000 m 7: **<Distance Unit: Us ft (ft)>,** last digit 1 / 10000 ft	WI 21, WI 22, WI 31, WI 81, WI 82, WI 83, WI 87
7	Sign	+: Positive value -: Negative value	WI 21, WI 22, WI 31, WI 51, WI 81, WI 82, WI 83, WI 87

Pos.	Name	Description of values	Applicable for
8-15 8-23	Data	Data includes a sequence of 8 (16) numerical or alphanumerical characters. ☞ Certain data blocks are allowed to carry more than one value for example ppm/mm. This data is automatically transferred with the according sign before each single value.	WI 11, WI 21, WI 22, WI 31, WI 51, WI 81, WI 82, WI 83, WI 87
16 24	Separating character	: Blank	WI 11, WI 21, WI 22, WI 31, WI 51, WI 81, WI 82, WI 83, WI 87

Output format - Pt,N,E,Ht,Date

Format

Point ID, Northing, Easting, Elevation, Date, Time <CR/LF>

Description of fields

The format settings are defined in **CONFIGURE Units & Formats**.

Field	Description
Point ID	Text describing the point identification
Northing	The northing coordinate.
Easting	The easting coordinate.
Elevation	The height coordinate.
Date	The measurement/origination date.
Time	The measurement/origination time.

Field	Description
<CR/LF>	**C**arriage **R**eturn **L**ine **F**eed

Example

2004,4997.635,6010.784,393.173,09/10/2001,16:34:12.2
2005,4997.647,6010.765,393.167,09/10/2001,16:34:12.4
2006,4997.657,6010.755,393.165,09/10/2001,16:34:12.7

Output format - Pt,E,N,Ht,Date

Format

This output format is identical to the Pt,N,E,Ht,Date format except the order of the Easting and Northing variables are reversed.

Fields are always separated by a comma. A comma is never placed before the Checksum field. When information for a field is not available, the position in the data string is empty.

19.2 GeoCOM Mode

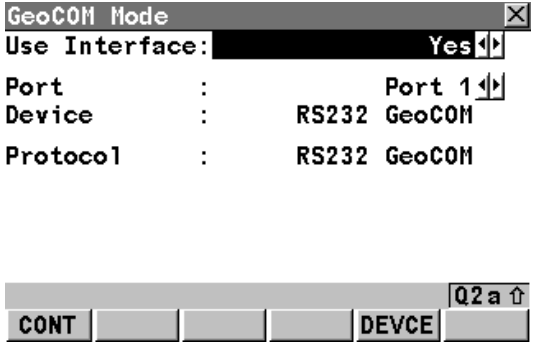
Description

The GeoCOM Mode permits communication of the R9 with a RC9 controller.

Access step-by-step

Step	Description
1.	Refer to "18.2.2 Accessing CONFIGURE Interfaces" to access **CONFIGURE Interfaces**
2.	**CONFIGURE Interfaces** Highlight **GeoCOM Mode**.
3.	**EDIT (F3)** to access **CONFIGURE GeoCOM Mode**.

CONFIGURE GeoCOM Mode



CONT (F1)
To accept changes and return to the screen from where this screen was accessed.

DEVCE (F5)
To create, select, edit or delete a device.

Description of fields

Field	Option	Description
<Use Interface:>	**Yes** or **No**	Activates the interface.
<Port:>	Output	Available if **<Use Interface: Yes>**. Port to be used.
<Device:>	Output	Available if **<Use Interface: Yes>**. Device to be used.
<Protocol:>	Output	Available if **<Use Interface: Yes>**. Protocol to be used.

Next step

IF a device is	THEN
not to be created or edited	**CONT (F1)** closes the screen and returns to the screen from where **CONFIGURE GeoCOM Mode** was accessed.
to be created or edited	**DEVCE (F5)** to create or edit a device.

19.3 Export Job

Description

- The Export Job interface allows data from a job to be exported from the instrument to an external device. Refer to "13.4 Exporting Data from a Job to another Device" for information on how to export data via RS232.
- The settings on this screen define the port and the device to which the data should be exported.

Access

Select **Main Menu: Config...\Interfaces...**. Highlight **Export Job**. **EDIT (F3)**.

OR

Select **Main Menu: Convert...\Export Data from Job**. Set **<Export To: RS232>**. **IFACE (F5)**.

CONFIGURE
Export Job Interface

The availability of the fields depend on the setting for **<Device:>**.

CONT (F1)
To accept changes and return to the screen from where this screen was accessed.

DEVCE (F5)
To create, select, edit or delete a device.

Description of fields

Field	Option	Description
<Use Device:>	**Yes** or **No**	Activates the interface.
<Port:>	Output	Available if **<Use Interface: Yes>**. Port to be used.
<Device:>	Output	The device currently assigned to the selected port within the active configuration set. The device which is selected determines the availability of the next fields.

Next step

CONT (F1) returns to the screen from where **CONFIGURE Export Job Interface** was accessed.

20 Config...\Interfaces... - Controlling The Device

20.1 Radios for Remote Control

Description

The following radio for remote control supports channel changing:

- RH9
- RH9-GLRBT

Configure RH9 connection step-by-step

Refer to the stated chapter for more information on screens.

Step	Description	Refer to chapter
1.	Access **CONFIGURE Interfaces**.	18.2.2
2.	In **CONFIGURE Interfaces** highlight **GeoCOM Mode** when port 2 is set active.	
3.	**CTRL (F4)** to access **CONFIGURE Radio Handle**.	
4.	**CONFIGURE Radio Handle**. **<Radio Type:>** The type of protocol. **<Link Number:>** The assigned channel number (from 0 to 20). ☞ The link number for the RC9 controller and the radio must be the same. **<Set as:>** The option **Remote** or **Base** are available. **Remote** sets the radio into remote mode.	

Step	Description	Refer to chapter
	Base sets the radio into base mode. ☞ The radio modules inside the RC9 controller and the radio must be set to opposite settings. It is recommended to set the RC9 controller to **Remote** and the RH9 to **Base**.	
☞	**DEFLT (F5)** To recall the default settings.	

20.2 RS232

Description

RS232 is a standard serial communication method that is able to transfer data without the need for predefined time slots. RS232 can be used, with a Bluetooth housing, to provide a wireless connection to another Bluetooth enabled device, for example, a computer.

Configure RS232 connection step-by-step

Step	Description
1.	Refer to "18.2.2 Accessing CONFIGURE Interfaces" to access **CONFIGURE Interfaces**.
2.	In **CONFIGURE Interfaces** highlight an interface which has an RS232 device attached.
3.	**CTRL (F4)** to access **CONFIGURE RS232 Connection**.
4.	**CONFIGURE RS232 Connection** **<Device:>** The type of device highlighted when **CONFIGURE RS232 Connection** was accessed. **<Bluetooth:>** Some devices ask for the identification number of the Bluetooth. The identification number of Stonex®'s Bluetooth is 0000. **<ID Address:>** Available for **<Bluetooth: Yes>**. The ID address of the Bluetooth device to be used.
☞	**SRCH (F4)** available for **<Bluetooth: Yes>**, to search for all available Bluetooth devices. If more than one Bluetooth device is found a list of available devices is provided.
5.	**CONT (F1)** returns to **CONFIGURE Interfaces**.

21 Tools...\Format Memory Device

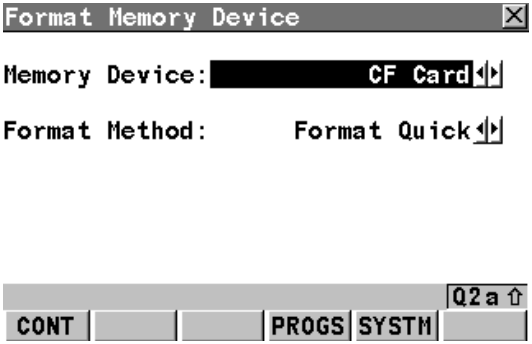
Description

Allows the CompactFlash card and the System RAM to be formatted. All data will be erased. Refer to "Appendix B Memory Types" for more information on the types of memory devices available.

Access

Select **Main Menu: Tools...\Format Memory Device**.

TOOLS
Format Memory Device



CONT (F1)
To format a memory device and return to the screen from where this screen was accessed.

PROGS (F4)
To format the application programs memory.

SYSTM (F5)
To format System RAM memory.

Description of fields

Field	Option	Description
<Memory Device:>		The type of memory to be formatted.
	CF Card	For instruments without internal memory.

Field	Option	Description
	CF Card or **Internal Memory**	For instruments with CompactFlash card and internal memory.
<Format Method:>	**Format Quick**	After formatting, data is not visible anymore but still exists on the memory device and is overwritten as and when required.
	Format Complete	Data is fully deleted.

Next step

IF	THEN
the CompactFlash card is to be formatted	**CONT (F1)** to format the memory device and return to **R9 Main Menu**.
the application programs memory is to be formatted	**PROGS (F4)** to format the application programs memory. All loadable application programs are deleted.
the System RAM is to be formatted	**SYSTM (F5)** to format the System RAM.

If the System RAM is formatted all system data such as user defined configuration sets and codelists will be lost.

22 Tools...\Transfer Objects...

Description

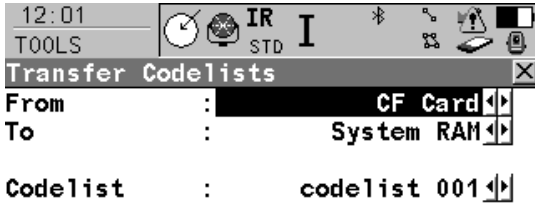
This chapter describes the basic procedure for transferring objects between the CompactFlash card and the System RAM. Refer to "Appendix C Directory Structure of the Memory Device" for information about file types and locations of files on the CompactFlash card.

Access

Select **Main Menu: Tools...\Transfer Objects...\XX**.

TOOLS
Transfer XX

The available fields on the screen depend on the option selected in **Main Menu: Tools...\Transfer Objects...**.



CONT (F1)
To transfer an object and return to the screen from where this screen was accessed.

ALL (F3)
Available for some transfer object options. To transfer all objects.

Description of fields

Field	Option	Description
<From:>		Memory device to transfer object from.
	CF card	Transfer from CompactFlash card.

Field	Option	Description
	System RAM	Transfer from System RAM. Available unless object to transfer is a job.
	Internal Memory	Transfer from internal memory.
<To:>	Output	Memory device to transfer object to. Memory device not selected in **<From:>**.
<Codelist:>	Choicelist	To select the codelist to be transferred.
<Config Set:>	Choicelist	To select the configuration set to be transferred.
<Format File:>	Choicelist	To select the format files to be transferred.
<Job:>	Choicelist	To select the job to be transferred between CompactFlash card and internal memory.

Next step

IF all XX	THEN
are to be transferred	**ALL (F3)** transfers all objects in list.
are not to be transferred	**CONT (F1)** transfers selected object.

23 Tools...\Upload System Files...

23.1 Application Programs

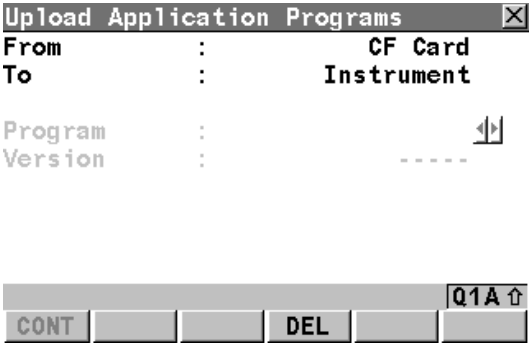
Description

Application program uploads are possible from the CompactFlash card to the application programs memory. These files are stored in the \SYSTEM directory of the memory device and use the extension *.a*.

Access

Select **Main Menu: Tools...\Upload System Files...\Application Programs**.

TOOLS
Upload Application Programs



CONT (F1)
To upload an application program and return to the screen from where this screen was accessed.

DEL (F4)
To delete an application program.

Description of fields

Field	Option	Description
<From:>	Output	Upload from CompactFlash card.
<To:>	Output	Upload to application program memory.
<Program:>	Choicelist	List of program files stored on the CompactFlash card.
<Version:>	Output	Version of the program file chosen.

Next step
CONT (F1) uploads the selected application program.

23.2 System Languages

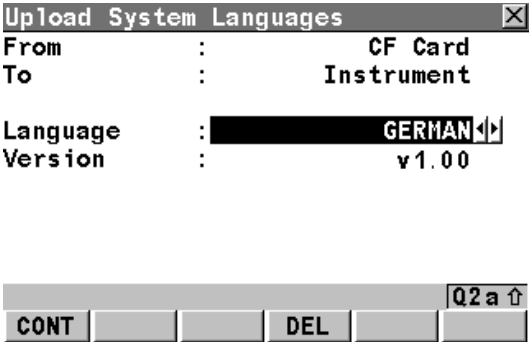
Description

System language uploads are possible from the CompactFlash card to the instrument. These files are stored in the \SYSTEM directory of the active memory device and use an extension that is individual to each language.

Access

Select **Main Menu: Tools...\Upload System Files...\System Languages**.

TOOLS
Upload System Languages



CONT (F1)
To upload a system language and return to the screen from where this screen was accessed.

DEL (F4)
To delete a language from the System RAM.

Description of fields

Field	Option	Description
<From:>	Output	Upload from CompactFlash card.
<To:>	Output	Upload to the instrument.
<Language:>	Choicelist	List of language files stored on the CompactFlash card.
<Version:>	Output	Version of the language file.

Next step
CONT (F1) uploads the selected language.

It is not possible to have more than three language files stored on the instrument. English is always available as the default language and cannot be deleted.

23.3 Instrument Firmware

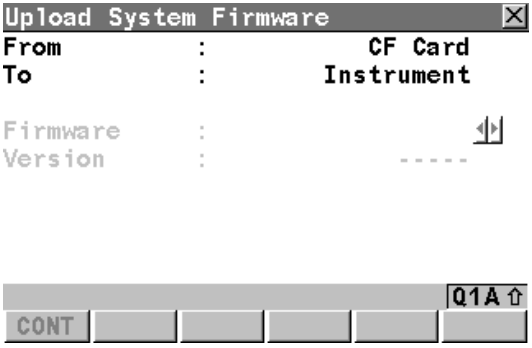
Description

Firmware uploads are possible from the CompactFlash card to the instrument. These files are stored in the \SYSTEM directory of the active memory device and use the extension *.fw.

Access

Select **Main Menu: Tools...\Upload System Files...\Instrument Firmware**.

TOOLS
Upload System Firmware



CONT (F1)
To upload firmware and return to the screen from where this screen was accessed.

Description of fields

Field	Option	Description
<From:>	Output	Upload from CompactFlash card.
<To:>	Output	Upload to the instrument.
<Firmware:>	Choicelist	List of firmware files stored on the CompactFlash card.
<Version:>	Output	Version of the firmware file.

Next step
CONT (F1) to upload firmware.

24 Tools...\Calculator

24.1 Overview

Description

The calculator can be used to perform the following arithmetic operations such as

- addition, subtraction, multiplication and division
- statistics
- trigonometry, hyperbolic trigonometry and calculations with Pi
- polar, rectangular and angle conversions
- powers, logs, roots and exponential functions.

Operating modes

The calculator has two operating modes - RPN mode and Standard mode.
The arithmetic operations available are identical, the difference lies in the way information is entered, stored and displayed on the screen.

Type	Description
RPN	**R**everse **P**olish **N**otation This operating mode was developed as a way of writing mathematical expressions without using parenthesis and brackets. Many scientific calculators, for example Hewlett Packard calculators, are implemented with this operating mode. Values are entered and kept in a working stack.
Standard	This operating mode is based on the principles of conventional pocket calculators. There is no stacking of values.

24.2 Accessing the Calculator

Access

Select **Main Menu: Tools...\Calculator**.

OR

Press **USER**. Refer to "2 USER Key" for information on the **USER** key.

OR

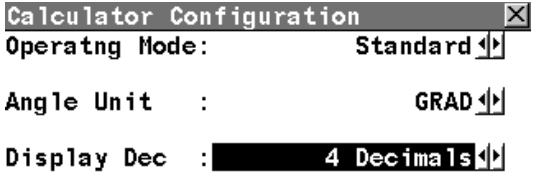
Press **CALC** in any screen when editing an input field for numeric characters, such as **<Azimuth:>** in **COGO Traverse Input**. Refer to "24.4.4 Calling and Closing the Calculator from an Input Field for Numeric Characters".

24.3 Configuring the Calculator

Access step-by-step

Step	Description
1.	Refer to "24.2 Accessing the Calculator" to access **TOOLS XX Calculator**.
2.	**SHIFT CONF (F2)** to access **TOOLS Calculator Configuration**.

TOOLS
Calculator Configuration



CONT (F1)
To accept changes and return to the screen from where this screen was accessed.

Description of fields

Field	Option	Description
<Operatng Mode:>	**RPN**	The principle of, for example, Hewlett Packard calculators. Refer to "24.1 Overview" for more information. Refer to "24.4.1 RPN Mode" for a working example.

Field	Option	Description
	Standard	The principle of conventional pocket calculators. Refer to "24.1 Overview" for more information. Refer to "24.4.2 Standard Mode" for a working example.
<Angle Unit:>		The unit used for trigonometric functions in the calculator. The selection here is independent from the angle setting in **CONFIGURE Units & Formats**.
	DEG	Degrees
	RAD	Radians
	GRAD	Gon
<Display Dec:>	From **0 Decimals** to **10 Decimals**	The number of decimal places shown in **TOOLS Calculator**.

Next step

CONT (F1) confirms the selections made and returns to the screen from where **TOOLS Calculator Configuration** was accessed.

24.4 Using the Calculator

24.4.1 RPN Mode

Requirements

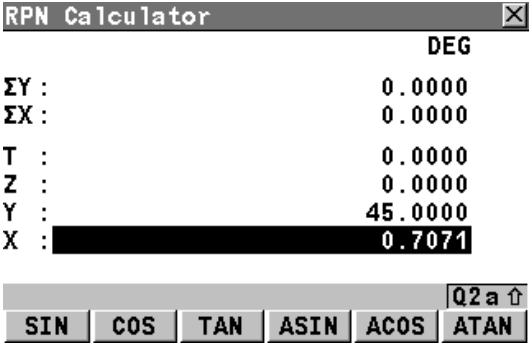
<Operatng Mode: RPN> in **TOOLS Calculator Configuration**.

Access

Refer to "24.2 Accessing the Calculator" to access **TOOLS RPN Calculator**.

TOOLS RPN Calculator

Refer to paragraph "Working example" for information about the operating principle.



The function keys **F1**-**F6** are allocated seven times. Using ▲ or ▼ the various allocations can be accessed. Refer to "24.4.3 Description of Softkeys" for information about the function keys.

Description of fields

Field	Option	Description
First field on the screen	Output	The unit used for trigonometric functions in the calculator as configured in **TOOLS Calculator Configuration**.
	DEG	Degrees

Field	Option	Description
	RAD	Radians
	GRAD	Gon
<ΣY:>	Output	The result of the sum or difference of values in **<Y:>** using **Σ+ (F1)** and **Σ- (F2)**.
<ΣX:>	Output	The result of the sum or difference of values in **<X:>** using **Σ+ (F1)** and **Σ- (F2)**.
<T:>	Output	Third stack. After an operation, the value from **<Z:>** is written here.
<Z:>	Output	Second stack. After an operation, the value from **<Y:>** is written here.
<Y:>	Output	First stack. After an operation, the value from **<X:>** is written here.
<X:>	User input	The value for the next operation.

Next step
SHIFT DONE (F4) returns to **R9 Main Menu**.

Working example

Task: Calculate (3 + 5) / (7 + 6).

Step	Description
1.	Type in 3.
2.	**ENTER**
3.	Type in 5.

Step	Description
4.	**ENTER**
☞	**<Y: 3>, <X: 5>**
5.	**+ (F1)**
☞	**<X: 8>**
6.	Type in 7.
7.	**ENTER**
☞	**<Y: 8>, <X: 7>**
8.	Type in 6.
9.	**ENTER**
☞	**<Z: 8>, <Y: 7>, <X: 6>**
10.	**+ (F1)**
☞	**<Y: 8>, <X: 13>**
11.	**/ (F4)**
☞	**<X: 0.61538>**

24.4.2 Standard Mode

Requirements

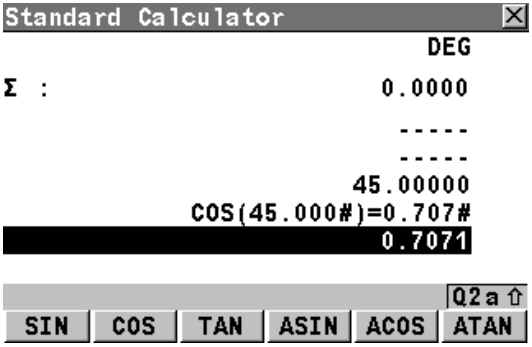
<Operatng Mode: Standard> in **TOOLS Calculator Configuration**.

Access

Refer to "24.2 Accessing the Calculator" to access **TOOLS Standard Calculator**.

TOOLS Standard Calculator

Refer to paragraph "Working example" for information about the operating principle.



The function keys **F1**-**F6** are allocated seven times. Using ▲ or ▼ the various allocations can be accessed. Refer to "24.4.3 Description of Softkeys" for information about the function keys.

Description of fields

Field	Option	Description
First field on the screen	Output	The unit used for trigonometric functions in the calculator as configured in **TOOLS Calculator Configuration**.
	DEG	Degrees
	RAD	Radians

Field	Option	Description
	GRAD	Gon
<Σ:>	Output	The result of the sum or difference of values in the last field on the screen using **Σ+ (F1)** and **Σ- (F2)**.
Third to sixth field on the screen	Output	Previously entered value OR Latest operation including result # indicates that the value is cut after the third decimal.
Last field on the screen	User input	The value for next operation or result from latest operation.

Next step
SHIFT DONE (F4) returns to **R9 Main Menu**.

Working example

Task: Calculate (3 + 5) / (7 + 6).

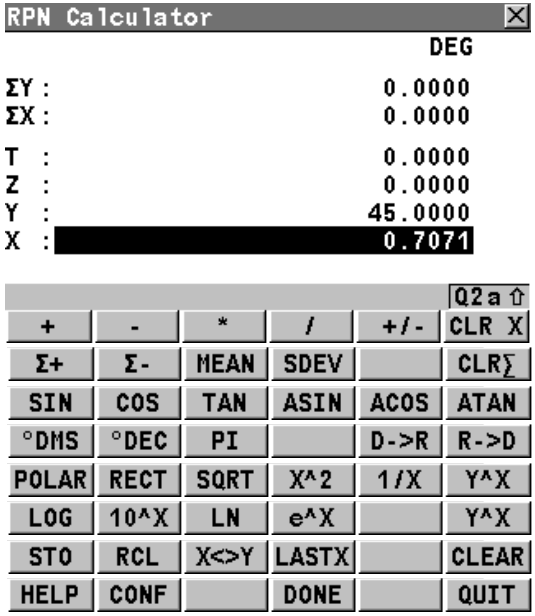
Step	Description
1.	Type in 3.
2.	**ENTER**
3.	**+ (F1)**
4.	Type in 5.
5.	**ENTER**
☞	Last field on the screen displays **8.00000**.
6.	▲ such that **STO (F1)** is visible.
7.	**STO (F1)**
8.	▼ such that **+ (F1)** is visible.
9.	Type in 7.
10.	**ENTER**
11.	**+ (F1)**
12.	Type in 6.
13.	**ENTER**
☞	Last field on the screen displays **13.00000**.
☞	Remember **13.00000**.
14.	▲ such that **REC (F2)** is visible.
15.	**REC (F2)** to recall 8.00000.
16.	**ENTER**
17.	▼ such that **/ (F4)** is visible.

Step	Description
18.	**/ (F4)**
19.	Type in 13.
20.	**ENTER**
☞	Last field on the screen displays **0.61538**.

24.4.3 Description of Softkeys

Overview of softkeys

The softkeys shown and described are those of **<Operatng Mode: RPN>**. Most of the softkeys are identical and their functionality is similar to that for **<Operatng Mode: Standard>**.
The function keys **F1**-**F6** are allocated seven times with softkeys. Using ▲ or ▼ the various allocations can be accessed.



Description of softkeys

First level

+ (F1)
To add **<X:>** and **<Y:>**.

- (F2)
To subtract **<X:>** from **<Y:>**.

*** (F3)**
To multiply **<X:>** by **<Y:>**.

/ (F4)
To divide **<Y:>** by **<X:>**.

+/- (F5)
To change between positive and negative algebraic sign for **<X:>**.

CLR X (F6)
To clear **<X:>**.

▼ to access the **Second level**

Σ+ (F1)
To add **<X:>** to **<ΣX:>** and **<Y:>** to **<ΣY:>**.

Σ- (F2)
To subtract **<X:>** from **<ΣX:>** and **<Y:>** from **<ΣY:>**.

MEAN (F3)
To calculate the mean **<ΣX>**.

SDEV (F4)
To calculate the standard deviation for **<ΣX>**.

CLRΣ (F6)
To clear **<ΣX>** and **<ΣX>**.

▼ to access the **Third level**

SIN (F1)
To calculate sine of **<X:>**.
COS(F2)
To calculate cosine of **<X:>**.
TAN (F3)
To calculate tangent of **<X:>**.
ASIN (F4)
To calculate arcsine of **<X:>**.
ACOS (F5)
To calculate arccosine of **<X:>**.
ATAN (F6)
To calculate arctangent of **<X:>**.

▼ to access the **Fourth level**

°DMS (F1)
To convert decimal degrees into dd.mm.ss.
°DEC(F2)
To convert dd.mm.ss into decimal degrees.
PI (F3)
To insert **<X: 3.1415926536>**. The number of decimals depends on the selection for **<Display Dec:>** in **TOOLS Calculator Configuration**.
D -> R (F5)
To convert degrees into radians.
R -> D (F6)
To convert radians into degrees.

▼ to access the **Fifth level**

POLAR (F1)
Conversion of rectangular coordinates into polar coordinates. The y coordinate must be visible in **<Y:>** and the x coordinate in **<X:>** when pressing this key. The angle is displayed in **<Y:>** and the distance in **<X:>**.

RECT(F2)
Conversion of polar coordinates into rectangular coordinates. The angle must be visible in **<Y:>** and the distance in **<X:>** when pressing this key. The y coordinate is displayed in **<Y:>**, the x coordinate in **<X:>**.

SQRT (F3)
To calculate $\sqrt{}$ **<X:>**.

X^2 (F4)
To calculate **<X:>**^{2}.

1/X (F5)
To inverse **<X:>**.

Y^X (F6)
To calculate **<Y:>**$^{\text{<X:>}}$.

▽ to access the **Sixth level**

LOG (F1)
To calculate the $\log_{10}$ **<X:>**.
10^X(F2)
To calculate $10^{\text{<X:>}}$.
LN (F3)
To calculate the $\log_e$ **<X:>**.
e^X (F4)
To calculate $e^{\text{<X:>}}$.
Y^X (F6)
To calculate **<Y:>** $^{\text{<X:>}}$.

▽ to access the **Seventh level**

STO (F1)
To store **<X:>** to the memory. Up to ten values can be stored.
RCL (F2)
To recall a value for **<X:>** from the memory. Up to ten values can be recalled.
X<>Y (F3)
To swap the values for **<X:>** and **<Y:>**.
LASTX (F4)
To recall the last **<X:>** before recent calculation.
CLEAR (F6)
To delete everything.

SHIFT to access the second level of function keys

SHIFT CONF (F2)
To configure the calculator.

SHIFT DONE (F4)
To return to **R9 Main Menu**.

24.4.4 Calling and Closing the Calculator from an Input Field for Numeric Characters

COGO traverse calculation is used as example.

Call and close calculator step-by-step

Step	Description	Refer to chapter
1.	Select **Main Menu: Programs...\COGO** to access the screen **COGO COGO Begin**.	
2.	**COGO COGO Begin** Check the settings.	
3.	**CONT (F1)** to access **COGO COGO Menu**.	
4.	**COGO COGO Menu** Highlight **Traverse**.	
5.	**CONT (F1)** to access **COGO Traverse Input**.	
6.	**COGO Traverse Input** Highlight **<Azimuth:>**.	
7.	**ENTER**	
8.	**CALC (F5)** to access **TOOLS XX Calculator**.	
	If a value had already been typed in for **<Azimuth:>**, this value is taken over into the input field in **TOOLS XX Calculator**.	
9.	**TOOLS XX Calculator**	

Step	Description	Refer to chapter
	Perform the calculations.	24.4.1, 24.4.2
10.	**SHIFT DONE (F4)** to return to **COGO Traverse Input**.	
☞	The calculated value is taken over for **<Azimuth:>**.	

25 Tools...\File Viewer

Description

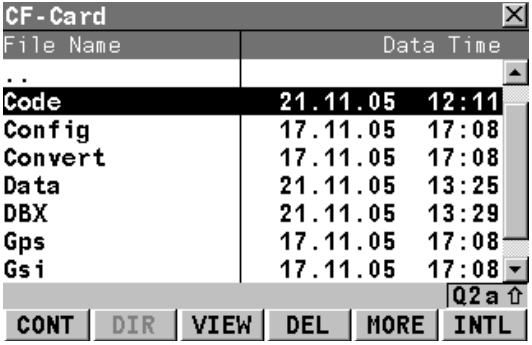
Allows ASCII files on the memory device to be viewed. The ASCII file can have up to 500 KB. Refer to "Appendix C Directory Structure of the Memory Device" for more information on the contents of folders on the memory device.

The \DBX directory cannot be accessed to view files.

Access

Select **Main Menu: Tools...\File Viewer**.

TOOLS Device\Directory



CONT (F1)
To access the highlighted directory or to view the highlighted file.

DIR (F2)
Available for a directory or **..** being highlighted. To access the highlighted directory or to move up one directory.

VIEW (F3)
Available for a file being highlighted. To view the highlighted file. Accesses **TOOLS View File: File Name**. Refer to "TOOLS View File: File Name".

DEL (F4)
Available for a file being highlighted. To delete the highlighted file.

MORE (F5)
To display information about the size of a directory or file.

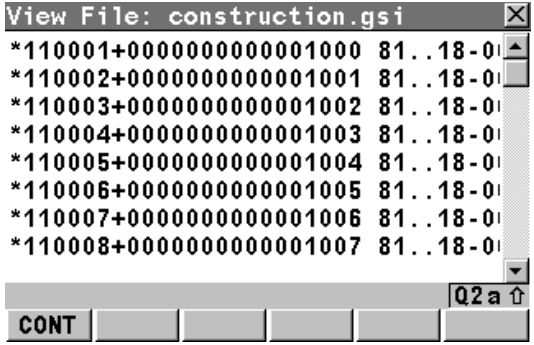
Description of columns

Column	Description
First	Directories and files are displayed if available. The file extension is shown for files. \ at the beginning of a line indicates a directory. .. is displayed at the top of the list if a directory has been accessed.
Second	Date of the directory or file.
Third	Time of the directory or file.

Next step

IF	THEN
the screen is to be quit	**ESC** to return to **R9 Main Menu**.
a directory is to accessed	highlight the directory and **DIR (F2)**.
a file is to be viewed	highlight the file and **VIEW (F3)**. Refer to "TOOLS View File: File Name".

TOOLS
View File: File Name



CONT (F1)
To return to the screen from where this screen was accessed.

Keys

Keys	Function
▲	Moves up.
▼	Moves down.
▶	Moves right.
◀	Moves left.

Next step
CONT (F1) returns to the screen from where **TOOLS View File: File Name** was accessed.

26 Tools...\Licence Keys

Description

- A licence key can be used to activate application programs and protected options.
- A licence key file can be uploaded to the instrument. To upload a licence key file the file should be located on the \SYSTEM directory of the CompactFlash card. Licence key files use the naming convention L_123456.key, where 123456 is the instrument serial number.
- Licence keys can also be typed in manually in **Main Menu: Tools...\Licence Keys** or the first time the application program is started.

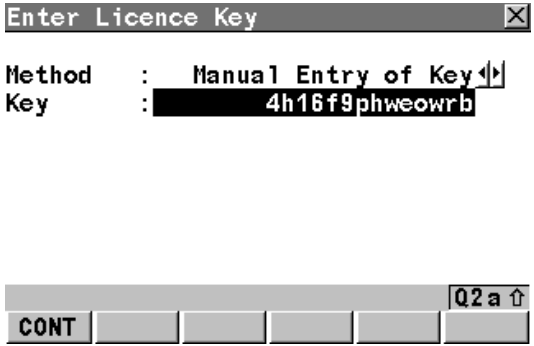
Access

Select **Main Menu: Tools...\Licence Keys**.

OR

Select an application program not yet activated.

TOOLS
Enter Licence Key



CONT (F1)
To accept changes and return to **R9 Main Menu** or continue with application program.

SHIFT DEL (F4)
To delete all licence keys on the instrument.

Description of fields

Field	Option	Description
<Method:>		The method used to input the licence key to activate the application program or the protected options.
	Upload Key File	The licence key file is uploaded from the CompactFlash card. The licence key file must be stored in the \SYSTEM directory on the CompactFlash card.
	Manual Entry of Key	Allows the licence key to be typed in manually.
<Key:>	User input	Available for **<Method: Manual Entry of Key>**. The licence key required to activate an application program. Entry is not case sensitive.

Next step

CONT (F1) returns to **R9 Main Menu** or continues with selected application program.

27 Tools...\Check & Adjust

27.1 Overview

Description

Stonex® instruments are manufactured, assembled and adjusted to the best possible quality. Quick temperature changes, shock or stress can cause deviations and influence the instrument accuracy.

It is therefore recommended to check and adjust the instrument from time to time. This can be done in the field by running through specific measurement procedures. The procedures are guided and have to be followed carefully and precisely as described in the following chapters. Some other instrument errors and mechanical parts can be adjusted mechanically.

Electronic adjustment

The following instrument errors can be checked & adjusted electronically:

l, t	Compensator longitudinal and transversal index errors
i	Vertical index error, related to the standing axis
c	Hz collimation error, also called line of sight error
a	Tilting axis error
iLock	iLock zero point error for Hz and V - option

Every angle measured in the daily work is corrected automatically if the compensator and the Hz-corrections are activated in the instrument configuration. Select **Main Menu: Config...\Instrument Settings...\Compensator** to check the settings.
The results from check and adjust are displayed as errors but used with the opposite sign as corrections when applied to measurements.

Mechanical adjustment

Refer to the Stonex® R9 User Manual for details.

Precise measurements

To get precise measurements in the daily work, it is important:

- To check and adjust the instrument from time to time.
- To take high precision measurements during the check and adjust procedures.
- To measure targets in two faces. Some of the instrument errors are eliminated by averaging the angles from both faces.
- To follow the four advices below.

☞

During the manufacturing process, the instrument errors are carefully determined and set to zero. As mentioned above, these errors can change and it is highly recommended to redetermine them in the following situations:

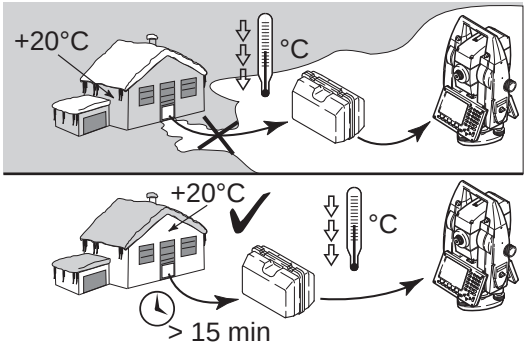
- Before the first use
- Before every high precision survey
- After rough or long transportations
- After long working periods
- After long storage periods
- If the temperature difference between current environment and the temperature at the last calibration is more than 20°C

☞

Before determining the instrument errors, the instrument has to be levelled up using the electronic level. **SHIFT F12** to access **STATUS Level & Laser Plummet**, Refer to "28.7 STATUS: Level & Laser Plummet".

The tribrach, the tripod and the underground should be very stable and secure from vibrations or other disturbances.

The instrument should be protected from direct sunlight in order to avoid thermal warming in general and especially on one side of the instrument housing.
It is also recommended to avoid strong heat shimmer and air turbulences.The best conditions can be found usually early in the morning and with overcast sky.



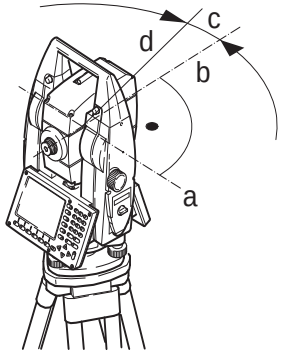
Before starting to work, the instrument has to become acclimatised to the ambient temperature. Approximately two minutes per °C temperature difference from storage to working environment but at least 15 min should be taken into account.

27.2 Details on Instrument Errors

General

Instrument errors occur, if the standing axis, the tilting axis and the line of sight are not precisely perpendicular to each other.

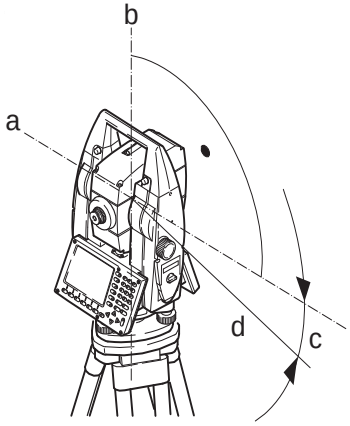
Hz collimation error (c)



a) Tilting axis
b) Line perpendicular to tilting axis
c) Hz collimation error (c), also called line of sight error
d) Line of sight

The Hz collimation error (c) is also called line of sight error. It is caused by the deviation between the optical line of sight, which means the direction in which the crosshairs points and the line perpendicular to the tilting axis. This error affects all Hz readings and increases with steep sightings.

Tilting axis error (a)

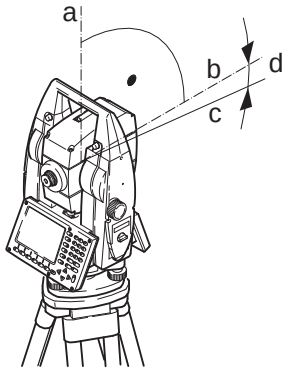


a) Axis perpendicular to the vertical axis
b) Mechanical vertical axis of the instrument, also called standing axis
c) Tilting axis error
d) Tilting axis

The tilting axis error (a) is caused by the deviation between the mechanical tilting axis and the line perpendicular to the vertical axis.

This error affects Hz angles. The affection is 0 in the horizon and increases with steep sights. To determine this error, it is necessary to point to a target located significantly below or above the horizontal plane. To avoid influences from the Hz collimation error (c), this has to be determined prior to the tilting axis error.

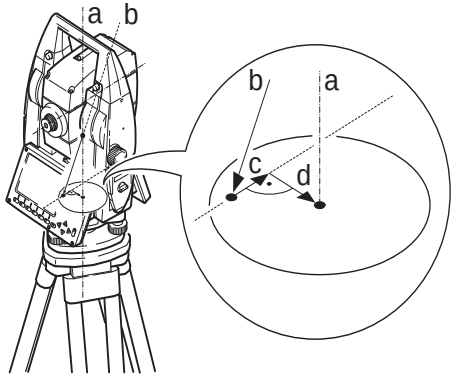
Vertical index error (i)



a) Mechanical vertical axis of the instrument, also called standing axis
b) Axis perpendicular to the vertical axis
c) V = 90° reading in a specific face
d) Vertical index error

A vertical index error (i) exists, if the 0° mark of the vertical circle reading doesn't coincide with the mechanical vertical axis of the instrument, also called standing axis.
The V index error (i) is a constant error that affects all vertical angle readings.

Compensator index errors (l, t)



a) Mechanical vertical axis of the instrument, also called standing axis
b) Plumb line
c) Longitudinal component (l) of the compensator index error
d) Transversal component (t) of the compensator index error

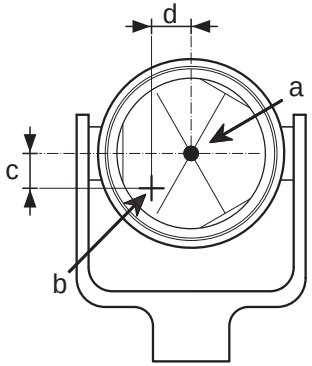
The compensator index errors (l, t) occur, if the vertical axis of the instrument and the plumb-line are parallel but the zero points of the compensator and the circular level do not coincide. The calibration procedure electronically adjusts the zero point of the compensator.

The plane of the dual axis compensator of the R9 is defined by a longitudinal component in direction of the telescope and a transversal component perpendicular to the telescope.

The longitudinal compensator index error (l) has a similar effect as the vertical index error and affects all vertical angle readings.

The transversal compensator index error (t) is similar to the tilting axis error. The effect of this error to the Hz angle readings is 0 at the horizon and increases with steep sightings.

iLock collimation errors



a) Centre of prism
b) Crosshairs
c) V component of iLock collimation error
d) Hz component of iLock collimation error

The iLock collimation error is the angular divergence between the line of sight, which means the direction in which the crosshairs point, and the iLock CCD camera axis, which detects the centre of the prism. Hz and V angles are corrected by the Hz and V components of the iLock calibration errors to measure exactly to the centre of the prism.

Note, that even after adjustment of the iLock, the crosshairs might not be positioned exactly on the centre of the prism after an iLock search. This is a normal effect. To speed up the iLock search, the telescope is not positioned exactly on the centre of the prism. The small rest deviations, the iLock offsets, are measured individually for each measurement and corrected electronically. This means that the Hz- and V- angles are corrected twice: first by the determined iLock errors for Hz and V and then by the individual small deviations of the current pointing, the iLock offsets.

Summary of errors to be adjusted electronically

Instrument error	Effects Hz	Effects V	Elimination with two face measurement	Automatically corrected with proper adjustment
c - Hz collimation error	✓	-	✓	✓
a - Tilting axis error	✓	-	✓	✓
l - Compensator index error	-	✓	✓	✓
t - Compensator index error	✓	-	✓	✓
i - V-Index error	-	✓	✓	✓
iLock Collimation error	✓	✓	-	✓

27.3 Accessing Check & Adjust Menu

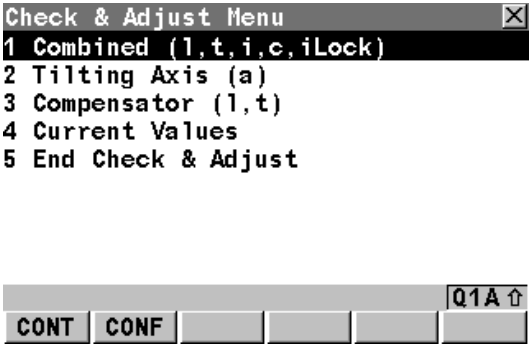
Access

Select **Main Menu: Tools...\Check & Adjust...**

OR

Press **USER**. Refer to "2 USER Key" for information on the **USER** key.

TOOLS
Check & Adjust Menu



CONT (F1)
To select the highlighted option and to continue with the subsequent screen.

CONF (F2)
To access the **TOOLS Configuration** screen. Refer to "27.4 Configure Check & Adjust".

Description of the Check & Adjust functions

Function	Description	Refer to chapter
Combined (l,t,i,c,iLock)	To determine the l, t, i, c and iLock instrument errors.	27.5
Tilting Axis (a)	To determine the tilting axis (a) error.	27.6
Compensator (l,t)	To determine the compensator (l, t) errors.	27.7
Current Values	To view the current instrument errors	27.8

Function	Description	Refer to chapter
End Check & Adjust	To exit the **TOOLS Check & Adjust Menu**.	

Next step

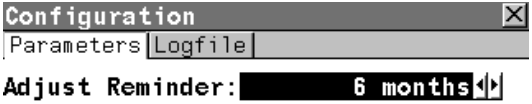
IF the task is to	THEN
determine the instrument errors	select one of the three available check and adjust procedures: **Combined (l, t, i, c, iLock)**, **Tilting Axis (a)** or **Compensator (l, t)**.
adjust the circular level	Refer to "27.9 Adjusting the Circular Level of the Instrument and Tribrach".
inspect the laser plummet	Refer to "27.11 Inspecting the Laser Plummet of the Instrument".
adjust the tripod	Refer to "27.12 Servicing the Tripod".
to end check and adjust	select **End Check & Adjust**.

27.4 Configure Check & Adjust

Access step-by-step

Step	Description
1.	Refer to "27.3 Accessing Check & Adjust Menu" to access **TOOLS Check & Adjust Menu**.
2.	**CONF (F2)** to access **TOOLS Configuration**.

TOOLS Configuration, Parameters page



CONT (F1)
To accept the settings and to return to the screen **TOOLS Check & Adjust Menu**

PAGE (F6)
To change to another page on this screen.

Description of fields

Field	Option	Description
<Adjust Reminder:>	**2 weeks,** **1 month,** **3 months,** **6 months,** **12 months** or	A reminder message is displayed each time the instrument is turned on if one or more adjustment values were determined longer ago than the time specified with this parameter. This helps to redetermine the instrument errors on a regular basis.
	Never	A reminder message to readjust the instrument is never displayed. This setting is not recommended.

Next step

PAGE (F6) changes to the **Logfile** page.

TOOLS Configuration, Logfile page

Description of fields

Field	Option	Description
<Write Logfile:>	**Yes** or **No**	To generate a logfile when the application program is exited. A logfile is a file to which data from an application program is written to. It is generated using the selected **<Format File:>**.
<File Name:>	Choicelist	Available for **<Write Logfile: Yes>**. The name of the file to which the data should be written. A logfile is stored in the \DATA directory of the active memory device. The data is always appended to the file.

Field	Option	Description
		Opening the choicelist accesses **XX Logfiles** where a name for a new logfile can be created and an existing logfile can be selected or deleted.
<Format File:>	Choicelist	Available for **<Write Logfile: Yes>**. A format file defines which and how data is written to a logfile. Format files are created using Stonex® Tools. A format file must first be transferred from the CompactFlash card to the System RAM before it can be selected. Refer to "22 Tools...\Transfer Objects..." for information on how to transfer a format file. Opening the choicelist accesses **XX Format Files** where an existing format file can be selected or deleted.

Next step
PAGE (F6) changes back to the **Parameters** page.

27.5 Combined Adjustment (l, t, i, c and iLock)

Access step-by-step

Step	Description
1.	Refer to "27.3 Accessing Check & Adjust Menu" to access **TOOLS Check & Adjust Menu**.
2.	In **TOOLS Check & Adjust Menu** highlight **Combined (l,t,i,c,iLock)**.
3.	**CONT (F1)** to access **TOOLS Combined I**.

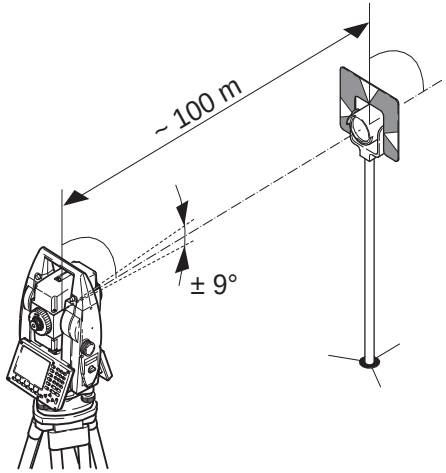
Description

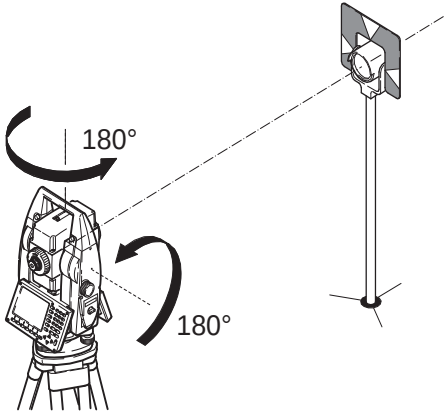
The combined adjustment procedure determines the following instrument errors in one process:

l, t	Compensator longitudinal and transversal index errors
i	Vertical index error, related to the standing axis
c	Hz collimation error, also called line of sight error
iLock Hz	iLock zero point error for Hz angle - option
iLock V	iLock zero point error for V angle - option

Combined procedure step-by-step

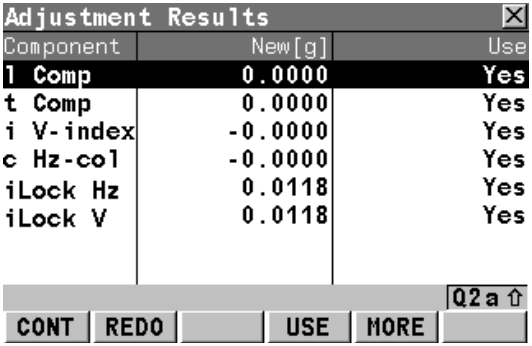
Step	Description
☞	Before determining the instrument errors, the instrument has to be: • levelled up using the electronic level • protected from direct sunlight • acclimatised to the ambient temperature, approximately two minutes per °C difference compared to the storage place. • Refer to "27.1 Overview" paragraph "Precise measurements" for more details.
1.	**TOOLS Check & Adjust Menu** Select the option **Combined (l,t,i,c,iLock)**
2.	**TOOLS Combined I** **<iLock Adjust: On>** Includes the determination of the iLock, Hz and V adjustment values. ☞ It is recommended to use a clean Stonex® circular prism as target. Do not use a 360° prism. **<iLock Adjust: Off>** iLock Hz and V adjustment value determination is not included. A prism is not necessarily required to run the procedure.

Step	Description	
3.		Aim the telescope accurately at a target at a distance of about 100 m. The target must be positioned within ± 9°/± 10 gon of the horizontal plane ☞ The procedure can be started in any telescope face. ☞ The fine pointing has to be performed manually in both faces.

Step	Description
4.	**MEAS (F1)** to measure and to continue to the next screen. Motorised instruments change automatically to the other face. 
5.	**TOOLS Combined II** **MEAS (F1)** to measure the same target in the other face and to calculate the instrument errors.
☞	If one or more errors are bigger than the predefined limits, the procedure has to be repeated. All measurements of the current run are rejected and are not averaged with the results from previous runs.
6.	**TOOLS Adjustment Accuracy** **<No. of Meas:>** Shows the number of runs executed. One run consists of a measurement in face I and face II.

Step	Description
	All other fields display the standard deviations of the determined adjustment errors. The standard deviations can be calculated from the second run onwards.
☞	It is recommended to measure at least two runs.
7.	**MEAS (F5)** if more runs have to be added. Continue with step 2. OR **CONT (F1)** to accept the measurements and to access **TOOLS Adjustment Results**. No more runs can be added later.

TOOLS
Adjustment Results



CONT (F1)
To accept and store the new determined instrument errors, where **Yes** is set in the Use column. Writes to or appends to an existing logfile, if the logfile recording has been enabled. Refer to "27.4 Configure Check & Adjust".

USE (F4)
To set **Yes** or **No** in the **Use** column for the highlighted set.

MORE (F5)
To view additional information about the current used old instrument errors.

REDO (F2)
To reject all results and to repeat the complete check and adjust procedure. Refer to step 2. of paragraph "Combined procedure step-by-step".

Description of columns and fields

Column	Option	Description
New [g]	**-----**	Shows the new determined and averaged instrument errors. The unit is displayed in [].
Use	**Yes**	Stores the new adjustment error.
	No	Keeps the currently used error active on the instrument and rejects the new one.
Old [g]	**-----**	Shows the old adjustment errors, which are currently valid on the instrument. The unit is displayed in [].

Next step

IF the results are	THEN
to be stored	**CONT (F1)** overwrites the old adjustment errors with the new ones, if **Yes** is set in the **Use** column.
to be determined again	**REDO (F2)** rejects all new determined adjustment values and repeats the whole procedure. Refer to step 2. of paragraph "Combined procedure step-by-step".

27.6 Tilting Axis Adjustment (a)

Access step-by-step

Step	Description
1.	Refer to "27.3 Accessing Check & Adjust Menu" to access **TOOLS Check & Adjust Menu**.
2.	In **TOOLS Check & Adjust Menu** highlight **Tilting Axis (a)**.
3.	**CONT (F1)** to access **TOOLS Tilting-Axis Adjustment I**.

Description

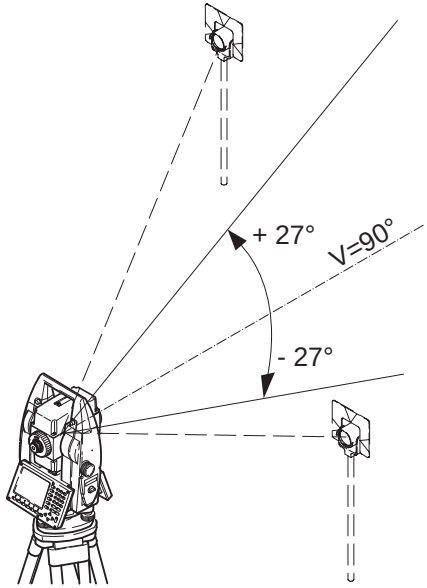
This procedure determines the following instrument error:

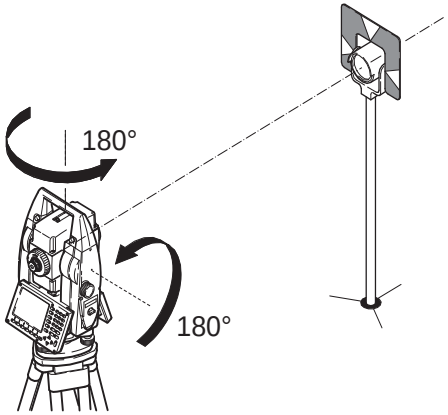
a Tilting axis error

Tilting axis adjustment step-by-step

The following table explains the most common settings. Refer to the stated chapter for more information on screens.

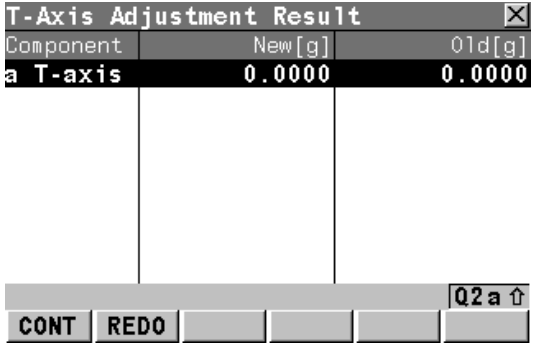
Step	Description	Refer to chapter
	Before determining the tilting axis error, the instrument has to be: • levelled up using the electronic level • protected from direct sunlight • acclimatised to the ambient temperature, approximately two minutes per °C difference compared to the storage place. • The Hz collimation error has to be determined before.	27.1, 27.5
1.	**TOOLS Check & Adjust Menu** Select the option: **Tilting Axis (a)**	

Step	Description	Refer to chapter
2.	**TOOLS Tilting-Axis Adjustment I**  Aim the telescope accurately at a target at a distance of about 100 m. For distances less than 100 m make sure to precisely point to the target. The target must be positioned within at least 27°/30 gon above or beneath the horizontal plane. ☞ The procedure can be started in any telescope face. ☞ The fine pointing has to be performed manually in both faces.	

Step	Description	Refer to chapter
3.	**MEAS (F1)** to measure and to continue to the next screen. Motorised instruments change automatically to the other face.  	
4.	**TOOLS Tilting Axis Adjustment II** **MEAS (F1)** to measure the same target in the other face and to calculate the tilting axis error.	
☞	If the error is bigger than the predefined limit, the procedure has to be repeated. The measurements of the current run are then rejected and not averaged with the results from previous runs.	
5.	**TOOLS T-Axis Adjustment Accuracy** **<No. of Meas:>** Shows the number of runs executed. One run consists of a measurement in face I and face II.	

Step	Description	Refer to chapter
	<σ a T-axis:> shows the standard deviation of the determined tilting axis error. The standard deviation can be calculated from the second run onwards.	
☞	It is recommended to measure at least 2 runs.	
6.	**MEAS (F5)** if more runs have to be added. Continue with step 2. OR **CONT (F1)** to accept the measurements and to access **TOOLS T-Axis Adjustment Result**. No more runs can be added later.	

TOOLS
T-Axis Adjustment Result



CONT (F1)
To accept and record the new determined tilting axis error. Writes to or appends to an existing logfile, if the logfile recording has been enabled. Refer to "27.4 Configure Check & Adjust".

REDO (F2)
To reject the result and to repeat the complete check and adjust procedure. Refer to step 2. of paragraph "Tilting axis adjustment step-by-step".

Description of columns and fields

Column	Option	Description
New [g]	-----	Shows the new determined and averaged tilting axis error. The unit is displayed in [].
Old [g]	-----	Shows the old instrument error, which is currently valid on the instrument. The unit is displayed in [].

Next step

IF the result is	THEN
to be stored	**CONT (F1)** overwrites the old tilting axis error with the new one.
to be determined again	**REDO (F2)** rejects the new determined tilting axis error and repeats the whole procedure. Refer to step 2. of paragraph "Tilting axis adjustment step-by-step".

27.7 Compensator Adjustment (l, t)

Access step-by-step

Step	Description
1.	Refer to "27.3 Accessing Check & Adjust Menu" to access **TOOLS Check & Adjust Menu**.
2.	In **TOOLS Check & Adjust Menu** highlight **Compensator (l,t)**.
3.	**CONT (F1)** to access **TOOLS Compensator Adjustment**.

Description

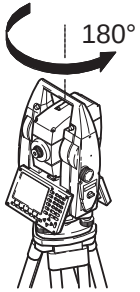
The compensator adjustment procedure determines the following instrument errors:

l Compensator longitudinal index error
t Compensator transversal index error

Compensator index adjustment step-by-step

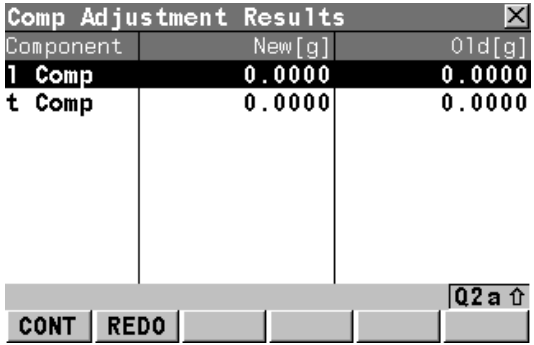
The following table explains the most common settings. Refer to the stated chapter for more information on screens.

Step	Description	Refer to chapter
	Before determining the compensator index errors, the instrument has to be: • levelled up using the electronic level • protected from direct sunlight • acclimatised to the ambient temperature, approximately two minutes per °C difference compared to the storage place.	27.1
1.	**TOOLS Check & Adjust Menu**	

Step	Description	Refer to chapter
	Select the option: **Compensator (l, t)**	
2.	**TOOLS Compensator Adjustment** **MEAS (F1)** to measure the first face. No target has to be aimed at.  Motorised instruments change to the other face and release a measurement automatically.	
☞	If one or more errors are bigger than the predefined limits, the procedure has to be repeated. All measurements of the current run are rejected and are not averaged with the results from previous runs.	
3.	**TOOLS Comp Adjustment Accuracy** **<No. of Meas:>** Shows the number of runs executed. One run consists of a measurement in face I and face II. **<σ l Comp:>** and **<σ t Comp:>** show the standard deviations of the determined adjustment errors. The standard deviations can be calculated from the second run onwards.	
☞	It is recommended to measure at least two runs.	

Step	Description	Refer to chapter
4.	**MEAS (F5)** if more runs have to be added. Continue with step 2. OR **CONT (F1)** to accept the measurements and to access **TOOLS Comp Adjustment Results**. No more runs can be added later.	

TOOLS Comp Adjustment Results



CONT (F1)
To accept and record the new determined instrument errors. Writes to or appends to an existing logfile, if the logfile recording has been enabled. Refer to "27.4 Configure Check & Adjust".

REDO (F2)
To reject all results and to repeat the complete check and adjust procedure. Refer to step 2. of paragraph "Compensator index adjustment step-by-step".

Description of columns and fields

Column	Option	Description
New [g]	-----	Shows the new determined and averaged instrument errors. The unit is displayed in [].
Old [g]	-----	Shows the old instrument errors, which are currently valid on the instrument. The unit is displayed in [].

Next step

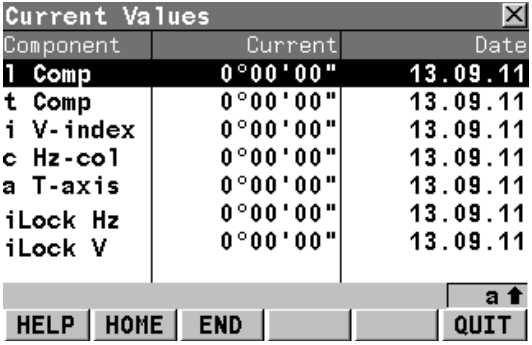
IF the results are	THEN
to be stored	**CONT (F1)** overwrites the old instrument errors with the new ones.
to be determined again	**REDO (F2)** rejects the new determined instrument errors and repeats the whole procedure. Refer to step 2. of paragraph "Compensator index adjustment step-by-step".

27.8 Current Instrument Errors

Access

Step	Description
1.	Refer to "27.3 Accessing Check & Adjust Menu" to access **TOOLS Check & Adjust Menu**.
2.	In **TOOLS Check & Adjust Menu** highlight **Current Values**.
3.	**CONT (F1)** to access **TOOLS Current Values**.

TOOLS Current Values



CONT (F1)
To return to the **TOOLS Check & Adjust Menu** screen. Refer to "27.3 Accessing Check & Adjust Menu".

MORE (F5)
To display information about the date of the determination, the standard deviation of the errors and the temperature during the determination.

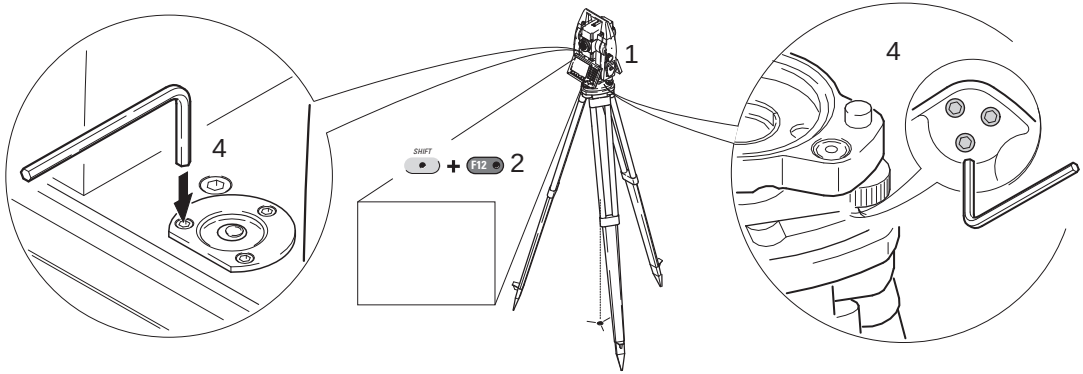
Next step

CONT (F1) returns to **TOOLS Check & Adjust Menu** screen. Refer to "27.3 Accessing Check & Adjust Menu".

☞ Note that the temperature of the environment around the instrument may differ from the temperature shown on the screen as it is the internal temperature of the instrument.

27.9 Adjusting the Circular Level of the Instrument and Tribrach

Adjusting the circular level step-by-step

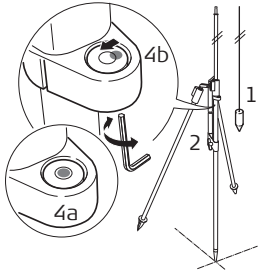


Step	Description
1.	Place and secure the instrument into the tribrach and onto a tripod.
2.	Using the tribrach footscrews, level the instrument with the electronic level. **SHIFT F12** to access **STATUS Level & Laser Plummet**.
3.	Check the position of the circular level on the instrument and tribrach.
4.	a) If both circular levels are centered, no adjustments are necessary
	b) If one or both circular levels are not centered, adjust as follows:
	Instrument: If it extends beyond the circle, use the supplied allen key to centre it with the adjustment screws. Turn the instrument by 200 gon (180°). Repeat the adjustment procedure if the circular level does not stay centered.

Step	Description
	Tribrach: If it extends beyond the circle, use the supplied allen key to centre it with the adjustment screws.
☞	After the adjustments, all adjusting screws should have the same tightening tension and no adjusting screw shall be loose.

27.10 Adjusting the Circular Level of the Prism Pole

Adjusting the circular level step-by-step

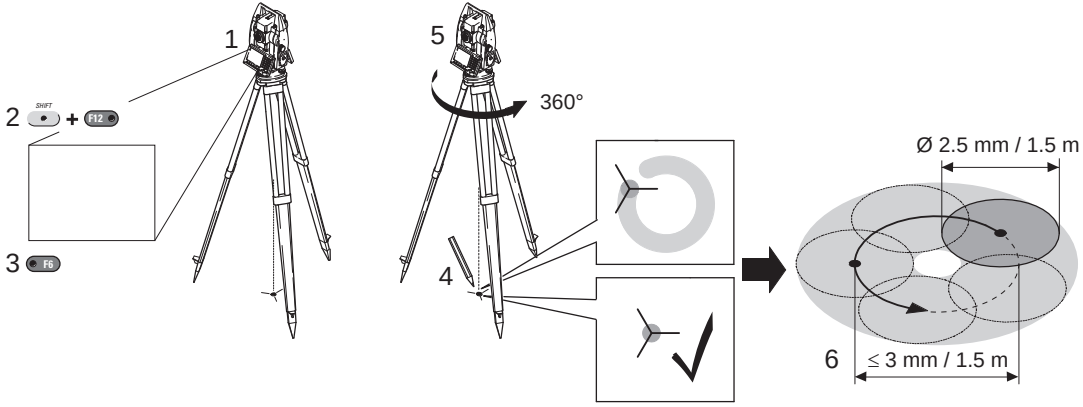


Step	Description
1.	Suspend a plumb line.
2.	Using a pole bipod, align the prism pole parallel to the plumb line.
3.	Check the position of the circular level on the prism pole.
4.	a) If the circular level is centered, no adjustment is necessary.
	b) If the circular level is not centered, use an allen key to centre it with the adjustment screws.
☞	After the adjustments, all adjusting screws should have the same tightening tension and no adjusting screw shall be loose.

27.11 Inspecting the Laser Plummet of the Instrument

The laser plummet is located in the vertical axis of the instrument. Under normal conditions of use, the laser plummet does not need adjusting. If an adjustment is necessary due to external influences, the instrument has to be returned to any Stonex® authorized service workshop.

Inspecting the laser plummet step-by-step



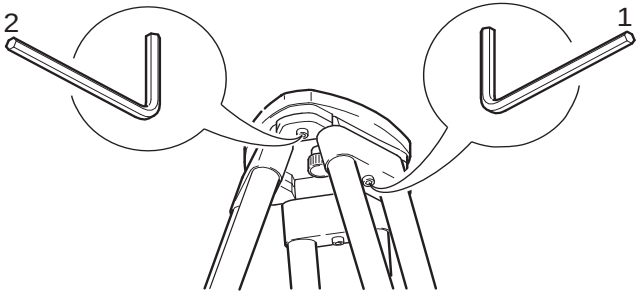
The following table explains the most common settings.

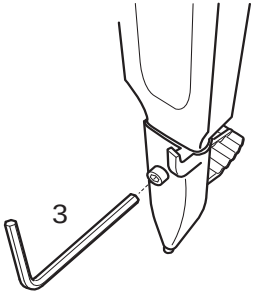
Step	Description
1.	Place and secure the instrument into the tribrach and onto a tripod.
2.	Using the tribrach footscrews, level the instrument with the electronic level. **SHIFT F12** to access **STATUS Level & Laser Plummet**.

Step	Description
3.	**PAGE (F6)** to access the **Laser Plummet** page. Switch on the laser plummet. Inspection of the laser plummet should be carried out on a bright, smooth and horizontal surface, like a sheet of paper.
4.	Mark the centre of the red dot on the ground.
5.	Turn the instrument through 360° slowly, carefully observing the movement of the red laser dot.
☞	The maximum diameter of the circular movement described by the centre of the laser point should not exceed 3 mm at a distance of 1.5 m.
6.	If the centre of the laser dot describes a perceptible circular movement or moves more than 3 mm away from the point which was first marked, an adjustment may be required. Inform your nearest Stonex® authorized service workshop. Depending on brightness and surface, the diameter of the laser dot can vary. At 1.5 m it is about 2.5 mm.

27.12 Servicing the Tripod

Servicing the tripod step-by-step





The following table explains the most common settings.

Step	Description
☞	The connections between metal and timber components must always be firm and tight.
1.	Tighten the leg cap screws moderately, with the supplied allen key.
2.	Tighten the articulated joints on the tripod head just enough to keep the tripod legs open when lifting the tripod off the ground.
3.	Tighten the allen screws of the tripod legs.

28 STATUS

28.1 STATUS Functions

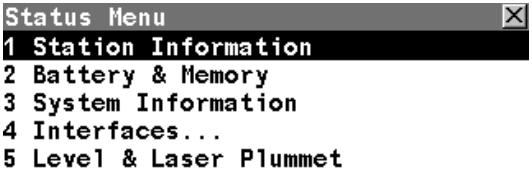
Description

The STATUS functions help using the instrument by showing the state of many instrument functions. All fields are output fields. Unavailable information is indicated by -----.

Access

Press **USER** and then **STAT (F3)**. Refer to "2 USER Key" for information on the **USER** key.

STATUS
Status Menu



CONT (F1)
To select the highlighted option and to continue with the subsequent screen.

Description of the STATUS functions

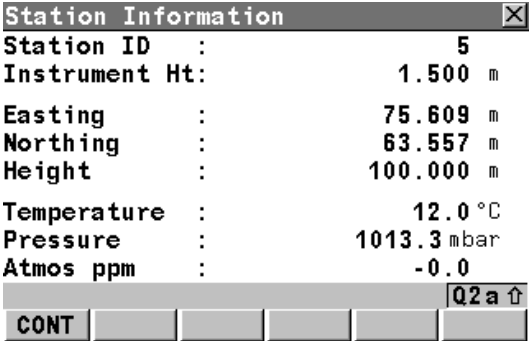
STATUS function	Description	Refer to chapter
Station Information	Information related to the current station set on the instrument.	28.2
Battery & Memory	Information related to use and status of battery and memory.	28.3
System Information	Information related to the instrument hardware and firmware.	28.4
Interfaces...	Information related to the configuration and use of interfaces, port and devices.	28.5
Bluetooth	Information related to the configuration and use of Bluetooth interfaces.	28.6
Level & Laser Plummet	Information related to electronic level and laser plummet.	28.7

28.2 STATUS: Station Information

Access

Select **STATUS: Station Information**.
Refer to "28.1 STATUS Functions" on how to access the STATUS menu.

STATUS
Station Information



CONT (F1)
To exit **STATUS Station Information**.

Description of fields

Field	Description
<Station ID:>	Station ID of the current station set-up.
<Instrument Ht:>	Instrument height of the current station set-up.
<Easting:>	Easting value of the instrument position.
<Northing:>	Northing value of the instrument position.
<Ortho Ht:>	The orthometric height of the instrument position is displayed.
<Temperature:>	Temperature set on the instrument.
<Pressure:>	Pressure set on the instrument.
<Atmos ppm:>	Atmospheric ppm set on the instrument.

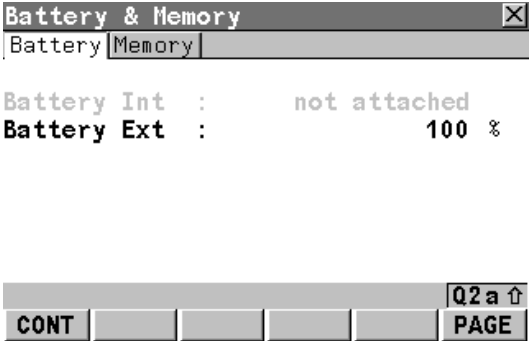
Next step
CONT (F1) to exit **STATUS Station Information**.

28.3 STATUS: Battery & Memory

Access

Select **STATUS: Battery & Memory**.
Refer to "28.1 STATUS Functions" on how to access the STATUS menu.
OR
Press **USER**. Refer to "2 USER Key" for information on the **USER** key.
OR
Tap the battery icon.
OR
Tap the CompactFlash card icon.

STATUS
Battery & Memory,
Battery page



CONT (F1)
To exit **STATUS Battery & Memory**.
PAGE (F6)
To change to another page on this screen.

Description of fields

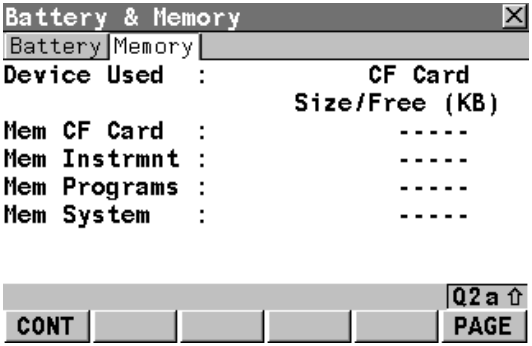
Field	Description
Any field	The percentage of remaining power capacity for all batteries are displayed numerically. Batteries not in use are shown in grey. For internal and external battery being attached at the same time the internal battery is used until it is empty and then the external battery is used.

Next step

PAGE (F6) changes to the **Memory** page.

STATUS Battery & Memory, Memory page

If no information for a field is available, for example no CompactFlash card is inserted, then ----- is displayed.



CONT (F1)
To exit **STATUS Battery & Memory**.

PAGE (F6)
To change to another page on this screen.

Description of fields

Field	Description
<Device Used:>	The memory device in use.
<Mem CF Card:>	The total/free memory for data storage on the CompactFlash card.
<Mem Instrmnt:>	The total/free memory for data storage on the internal memory. A grey field and grey ----- indicate an unavailable internal memory.
<Mem Programs:>	The total/free system memory used for application programs.
<Mem System:>	The total/free system memory. The system memory stores • instrument related files such as system settings. • survey related files such as codelists and configuration sets.

Next step

CONT (F1) to exit **STATUS Battery & Memory**.

28.4 STATUS: System Information

Access

Select **STATUS: System Information**.
Refer to "28.1 STATUS Functions" on how to access the STATUS menu.

OR

Press **USER**. Refer to "2 USER Key" for information on the **USER** key.

STATUS
System Information, Instrument page

Shows the type of instrument, the serial number, the equipment number, the ID of the instrument, the currently active system language and the availability of additional instrument hardware options.

Next step
PAGE (F6) changes to the **Firmware** page.

STATUS
System Information, Firmware page

Shows the versions of all system firmware.

Description of fields

Field	Description
<Firmware:>	Firmware version of the onboard software.
<Build User Iface:>	Build version of the onboard software.
<Build Processb.:>	Build version of the processor board.
<Telescope Fw:>	Firmware version of the telescope.
<Boot:>	Firmware version of the boot software.
<API:>	Firmware version for the application program interface.

Field	Description
<EF Interface:>	Firmware version for the electric front interface.
<Keyboard/Display:>	Firmware version for the graphical user interface.

Next step
PAGE (F6) changes to the **Application** page.

STATUS
System Information,
Application page

Shows the versions of all uploaded application programs.

Next step
CONT (F1) exits **STATUS System Information**.

28.5 STATUS: Interfaces...

Description

STATUS Interfaces gives an overview of all interfaces with the port and the devices currently assigned.

Access

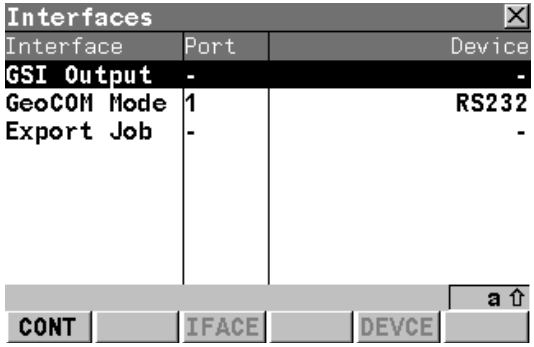
Select **STATUS: Interfaces...**.
Refer to "28.1 STATUS Functions" on how to access the STATUS menu.

OR

Press **USER**. Refer to "2 USER Key" for information on the **USER** key.

STATUS Interfaces

The screen gives an overview of all interfaces with the currently assigned port and device. Unavailable information is indicated by -----.



CONT (F1)
To exit **STATUS Interfaces**.

28.6 STATUS: Bluetooth

Description

This screen shows

- Bluetooth ports available and configured.
- the device attached and connected to each Bluetooth port.
- the ID address of each device.

Access

Select **STATUS: Bluetooth**.
Refer to "28.1 STATUS Functions" on how to access the STATUS menu.

OR

Tap the Bluetooth icon.

STATUS Bluetooth

The way information is displayed indicates the configuration status of the Bluetooth port and the connection status of the device.

Information displayed	Bluetooth port configured	Device connected
in black	✓	✓
in grey	✓	-
as -----	-	-

Next step

CONT (F1) exits **STATUS Bluetooth**.

28.7 STATUS: Level & Laser Plummet

Description

The electronic level is shown and can be centred.

Access

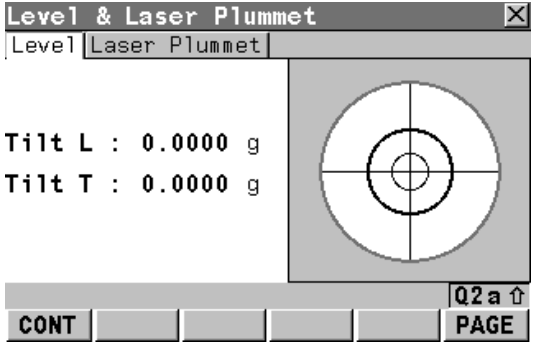
Select **STATUS: Level & Laser Plummet**.
Refer to "28.1 STATUS Functions" on how to access the STATUS menu.

OR

Press **USER**. Refer to "2 USER Key" for information on the **USER** key.

The level moves linear with the inclination values **<Tilt L:>** and **<Tilt T:>.** On the screen closest to the circular level, the electronic level moves down if the value in **<Tilt L:>** gets bigger and vice versa. If the value for **<Tilt T:>** gets bigger the level moves left and vice versa.

STATUS
Level & Laser Plummet,
Level page



CONT (F1)
To exit **STATUS Level & Laser Plummet**.

PAGE (F6)
To change to another page on this screen.

Description of fields

Field	Description
<Tilt L:>	Longitudinal tilt of the vertical axis.
<Tilt T:>	Transversal tilt of the vertical axis.

Next step

PAGE (F6) changes to the **Laser Plummet** page.

STATUS
Level & Laser Plummet, Laser Plummet page

Description of fields

Field	Option	Description
<Laser Plummet:>	**On** or **Off**	To turn the laser plummet on or off. Is always set on when accessing this screen. Changing this setting turns the laser plummet on or off immediately.
<Intensity:>	From **0 %** to **100 %**	The percentage of the intensity of the laser plummet is displayed numerically and graphically. The minimum value is 10%. Changing this value with the right and left arrow keys changes the intensity of the laser plummet immediately.

Next step

CONT (F1) exits **STATUS Level & Laser Plummet**.

---

29 Functions

29.1 EDM

Description

Electronic **D**istance **M**easurement **EDM** is the sensor used for distance measurements.
There are three different **<EDM Type:>** and five different **<EDM Mode:>** the instrument can work in. These terms are described below.
Refer to "16.1 EDM & iLock Settings" and to "3 Quick Settings - SHIFT USER" for more information.

EDM types

EDM Type	Description
IR	**<EDM Type: Reflector (IR)>** allows to measure the distance to a prism or reflector tape with the visible red laser. The last used options for **<Reflector:>**, **<Add. Constant:>**, **<Reflector Ht:>** and **<EDM Mode:>** are applied. For **<Automation: iLock>** or **<Automation: Robotic>, <EDM Type: Reflector (IR)>** is automatically set. ☞ It is important to select the currently used **<Reflector:>** from the list to gain correct results.
RL	**<EDM Type: Reflctrless (RL)>** allows to measure distances to objects without a reflector with the visible red laser. The last used option for **<EDM Mode:>** is applied, **<Reflector: Reflectorless>** and **<Reflector Ht: 0.000>** are set. **<Automation: None>** is set.

EDM Type	Description
LO	**<EDM Type: Long Range (LO)>** allows to measure very long distances to prisms. The last used option for **<EDM Mode:>** and **<Reflector:>** are applied, **<Automation: None>** is set.

EDM modes

EDM Mode	Description
Standard	Pressing **ALL (F1)** or **DIST (F2)** a single measurement is performed with focus on accuracy and not on time.
Fast	Pressing **ALL (F1)** or **DIST (F2)** a single measurement is performed with focus on time, accuracy not as high as for **<EDM Mode: Standard>**.
Tracking	Pressing **ALL (F1)** or **DIST (F2)** continuous measurements are performed with focus on fast measurements. Press **REC (F3)** to store the measurements. ☞ **STOP (F1)** to stop tracking.
Average	Pressing **ALL (F1)** or **DIST (F2)** with **<Avg Max #Dist: n>** n measurements are performed with **<EDM Mode: Standard>**. During measurements the current average and standard deviation are displayed.

EDM Mode	Description
SynchroTrack	Available only for **<EDM Type: Reflector (IR)>**. This is the measurement mode for more precise measurements in Robotic mode. Pressing **ALL (F1)** or **DIST (F2)** a linear interpolation between the previous and following angle measurement is performed, based upon the timestamp of the EDM measurement. Using this interpolation procedure, a higher accuracy for all dynamic applications is possible.

29.2 Prism Search Methods

29.2.1 iLock

Description

iLock is the sensor which recognises and measures the position of a prism by means of a CCD array. A laser beam is transmitted and the reflected beam is received by the built in CCD array. The position of the reflected spot with respect to the centre of the CCD is computed. These iLock offsets are used to correct the horizontal and vertical angles. The iLock offsets are also used to control the motors which turn the instrument to centre the crosshairs to the prism. In order to minimise the time for measuring, the crosshairs are not moved to the exact centre of the prism. The iLock offset can be up to 500 cc depending on selected **<EDM Mode:>**. The iLock measures the iLock offsets between the crosshairs and prism centre and corrects the Hz and V angles accordingly. Therefore the Hz and V angles are measured to the prism-centre, even if the crosshairs are not aimed precisely at the centre of the prism.

For **<Automation: iLock>** the instrument can find a static prism and measure a distance once **ALL (F1)** or **DIST (F2)** is pressed. The instrument does not follow a moving prism.
Refer to "16.1 EDM & iLock Settings" and to "3 Quick Settings - SHIFT USER" for more information.

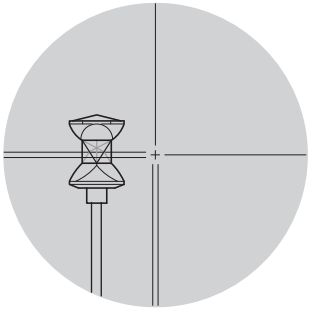
Field of view

The telescope field of view is the region seen when looking through the telescope. The Aim field of view is the region seen by the iLock.

Next step

IF the reflector is	THEN
in the field of view	Refer to paragraph "iLock measurement" for more information.
not in the field of view	Refer to paragraph "iLock search" for more information.

iLock measurement

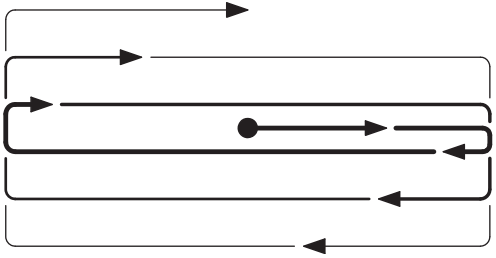


If the reflector is in the field of view and **<Automation: iLock>** the crosshairs are automatically positioned to the reflector when, for example **ALL (F1)** or **DIST (F2)** is pressed. No Aim search is started.

The displayed values are always related to the centre of the prism after **ALL (F1)** or **DIST (F2)** is pressed. For **ALL (F1)** these values are displayed only shortly after the key press.

The crosshairs of the telescope may not fully coincide with the centre of the prism when viewed through the telescope. The remaining iLock offsets for the horizontal and vertical angles are measured by the iLock sensor and applied to the measured and displayed angles.

iLock search



If the reflector is not in the field of view when **ALL (F1)** or **DIST (F2)** is pressed, an iLock search is started. For the iLock search the Aim window is scanned line by line starting at the current telescope position.
If the

- prism was not found: **RETRY (F5)** can be pressed to search for the reflector in an increased area.
- prism was found: The iLock measurement is performed to position the telescope to the centre of the prism.

iLock window

The iLock window is a relative window based on the current telescope position. The horizontal and vertical extent can be defined. Pressing **ALL (F1)**, **DIST (F2)** or **R.GO (F5)** starts an iLock search in the iLock window.

Dynamic iLock window

For **<Search with: iLock>** after loss of lock and prediction the prism is searched for with iLock in a dynamic iLock window. This window covers a horizontal region from the position of loss of lock to the current telescope position and the same extent on the other side. The vertical dimension of the dynamic window is one third of the horizontal expansion. Refer to "29.3 Robotic" for information on Robotic.

Automation modes

Automation	Description
None	Points are measured with **<Automation: None>**. iLock search and/or iLock measurement are not performed.
iLock	**<Automation: iLock>** is set. The iLock sensor is used for measurements to static reflectors. If needed an iLock measurement or iLock search is performed after pressing **ALL (F1)** or **DIST (F2)**. The accuracy of iLock measurements depends on the set **<EDM Mode:>**.
Robotic	**<Automation: Robotic>** is set. The iLock sensor is used to follow moving prisms and to find prisms after loss of lock. Depending on **<EDM Mode:>** single or continuous measurements are performed pressing **ALL (F1)** or **DIST (F2)**.

29.3 Robotic

Description

Robotic enables instruments to follow a moving prism. The iLock sensor is active. When **<Automation: Robotic>** and a distance measurement is initiated with **DIST (F2)** or **R.GO (F5)** is pressed, an iLock search is executed. The instrument locks onto the prism and follows its movements. iLock offsets are continuously applied to the angle measurements. When the instrument loses lock to the reflector, a search is executed with iLock.
Refer to "16 Config...\Instrument Settings..." and to "3 Quick Settings - SHIFT USER" for more information.

☞ If the speed of the reflector is too fast, the target may be lost. Make sure that the speed does not exceed the figure given in the technical data.

Enable Robotic

<Automation: Robotic>. The instrument is not yet locked onto the reflector and the iLock sensor is not active. Pressing **ALL (F1)**, **DIST (F2)**, **R.GO (F5)** or **CONT (F1)** in **QUICK SET Orientation With Compass**, **QUICK SET Positioning Hz/V**, **QUICK SET Move by Joystick** or **QUICK SET Check Recorded Pt/Backsight Pt** the iLock is used to find the reflector. When the reflector is found, the instrument locks onto the reflector. The instrument follows the moving reflector. The iLock sensor is active.

As long as the instrument is locked on, iLock offsets are continuously applied to the angle measurements. If the instrument loses lock to the prism the instrument may search for the prism with iLock.

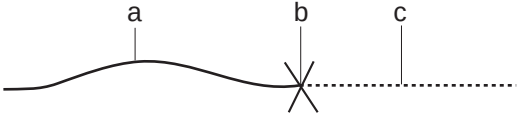
Loss of lock

When the instrument is locked onto a reflector, lock may be lost if the movement of the reflector is too fast for the instrument to follow or the reflector is hidden behind an object. After lock is lost, the prediction is used to find the prism again. Refer to paragraph "Prediction" for more information.

The iLock sensor is still active.

Whenever the prism is moved in the field of view of the telescope the instrument locks automatically to the prism.

Prediction



a) Moving reflector locked onto by the instrument
b) Loss of lock
c) Prediction

As long as the prism is being tracked by the instrument a mathematical filter continuously calculates the average speed and direction of the prism. If the line of sight between instrument and prism is disturbed, the instrument keeps on moving using these calculated values.This behaviour is called prediction. The prediction time can be configured.
During prediction the Robotic icon is displayed. If the prism comes into the field of view of the iLock it automatically locks on again.

Prism search after prediction

After prediction, the prism is searched for depending on the settings in the **CONFIGURE Automatic Prism Search** screen.

- **<Search with: No Search>**. If prism moved in field of view, prism is not searched for until **ALL (F1)**, **DIST (F2)**, **R.GO (F5)**, **CONT (F1)**, **SCT-> (F6)** or **SHIFT SCT<- (F5)** is pressed.
- **<Search with: iLock>**. prism is searched for in the dynamic Aim window with iLock.
- **<Search with: Last Point>**: The instrument turns back to the last stored point.

Relock

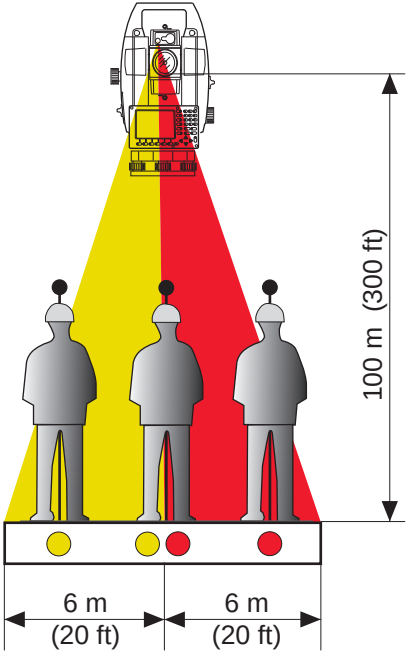
Independent of **<Search with:>** the instrument can relock onto the prism. Refer to paragraph "Enable Robotic" for information on how to enable lock.

29.4 SureBeam

Description

The SureBeam, navigation light consists of two differently coloured flashing lights in the telescope housing of the R9. The SureBeam is used for guidance into the line of sight. If the left light is seen, the prism should be moved right and vice versa. If both flashing lights can be seen, the prism is in the line of sight of the instrument.

Functionality



The SureBeam can be used

- to help guiding the reflector into the telescope line of sight when the instrument is remotely controlled and **<Automation: iLock>**.
- to stake out points

The instrument emits two differently colored flashing cones of light. At a target distance of 100 m the cones have a width of 6 m. Between the two cones of light a sector with a width of 30 mm is created where both guide lights are visible simultaneously. In this position the prism is in the line of sight of the instrument.

Using the SureBeam step-by-step

The following table explains the most common settings. Refer to the stated chapter for more information on screens.

Step	Description	Refer to chapter
1.	Set **<Automation: Robotic>** and press **COMPS (F1)** or **Hz/V (F2)** or **JSTCK (F3)** on the **QUICK SET Change Settings to:** screen OR Set **<SureBeam: On>** on the **CONFIGURE Lights, Display, Beeps, Text, Lights** page.	3.2 17.5
2.	Align instrument line of sight and prism, where both flashing SureBeam lights can be seen simultaneously.	
3.	**CONT (F1)** to lock onto the prism.	
4.	If the instrument has locked onto the prism the SureBeam is turned off automatically.	
☞	If the SureBeam was turned on in the **CONFIGURE Lights, Display, Beeps, Text, Lights** page, it has to be turned off by setting **<SureBeam: Off>**.	

☞ The SureBeam is turned off automatically once the instrument has locked onto a prism.

29.5 Illumination

Description

There are several different illumination types built into the instrument that all fulfill different functions. Some are to support measurements, for example the visible red laser pointer. Others, such as the screen illumination, are for more convenient work with the instrument. These different types of illumination are described below.

Laser plummet

The laser plummet allows setting up the instrument over a marked point. The laser beam is emitted from the bottom of the instrument, pointing to the ground. When the instrument is levelled and the laser beam points exactly at the ground point, the instrument is set up correctly. The laser plummet can be turned on and off. It is turned on automatically when opening the **STATUS Level and Laser Plummet** screen and turned off when leaving the screen.

Visible red laser pointer

The visible red laser pointer is used for reflectorless measurements. The visible red laser pointer is arranged coaxially with the line of sight of the telescope and emitted through the objective. If the instrument is well adjusted, the visible red laser beam coincides with the line of sight.

The direction of the beam should be inspected before precise distance measurements are executed, since an excessive deviation of the laser beam from the line of sight can cause inaccurate results.

Screen/key illumination

The screen and key illumination allows a more convenient working with the instrument when the lighting conditions are not ideal. They can be turned on in the **CONFIGURE Lights, Displays, Beeps, Text, Lights** page. To access this screen press **SHIFT F11** in any application program. Changes to the setting become effective instantly. Refer to "17.5 Lights, Display, Beeps, Text" for more information on screen and key illumination settings.

30 MapView Interactive Display Feature

30.1 Overview

Description

MapView is an interactive display feature embedded in the firmware but used by all application programs as well as data management. MapView provides a graphical display of the survey elements which allows for a better overall understanding of how the data being used and measured relates to each other.

Depending on the application program and where in the application program MapView is accessed from, different modes, and their associated functionality, are available.

The displayed data in all modes of MapView can be shifted by using both the arrow keys and the touchscreen.

MapView modes

MapView is available in three modes:

Map mode:
- Part of data management.
- Is also available within some application programs.
- Can be used to view, select and edit points, lines and areas.
- Available as the **Map** page in data management and some application programs.

Plot mode:
- Is available to view results in various application programs. For example, COGO application program.
- Available as the **Plot** page in some application programs.

Survey mode:
- Part of the Survey application program.
- Is available within some application programs, for example, Stakeout application program.
- Can be used to select lines and areas.

- Same as Map mode but also shows the positions of the instrument and the reflector.
- Provides special functionality when staking out points.
- Available as the Map page in Survey and some application programs.

Modes within application programs	It is possible to access different MapView modes from the same application program. For example, to access Map View in map mode or access the Map View in survey mode.
Displayable data	The data displayed in MapView is defined by the application program through which it was accessed, filters set in **MANAGE Sorts & Filters**, and the selections made in **XX MapView Configuration**.

30.2 Accessing MapView

Description

The MapView interactive display feature is provided as a page within all application programs and data management. It is accessed through the application program itself. Depending on the application program and from where in the application program MapView is accessed, different MapView modes are available.

Access step-by-step

Example access for map mode:

Step	Description
1.	Select **Main Menu: Manage...\Data**. OR Press **USER**. Refer to "2 USER Key" for information on the **USER** key. OR From a choicelist in some screens for example in application programs.
2.	**PAGE (F6)** until **MANAGE Data: Job Name**, **Map** page is active.

Example access for plot mode:

Step	Description
1.	Press **ON**. Highlight **COGO**. **CONT (F1)**. Refer to "31.2 Accessing the Programs Menu" for information on the ON key. OR Press **USER**. Refer to "2 USER Key" for information on the **USER** key.
2.	**CONT (F1)** to access **COGO COGO Menu**.
3.	**COGO COGO Menu** Highlight **Intersections**.
4.	**CONT (F1)** to access **COGO Intersection Input**.
5.	**COGO Intersection Input** Choose a method and enter appropriate data.
6.	**CALC (F1)** to access **COGO XX Results**.
7.	**PAGE (F6)** until **COGO XX Results**, **Plot** page is active.

Example access for survey mode:

Step	Description
1.	Select **Main Menu: Survey**. OR Press **USER**. Refer to "2 USER Key" for information on the **USER** key. OR Press **ON**. Highlight **Survey**. **CONT (F1)**. Refer to "31.2 Accessing the Programs Menu" for information on the **ON** key.
2.	**CONT (F1)** to access **SURVEY Survey: Job Name**.
3.	**PAGE (F6)** until **SURVEY Survey: Job Name**, **Map** page is active.

MapView can be open multiple times, for example as **SURVEY Survey: Job Name**, **Map** page accessed from **R9 Main Menu** and as **MANAGE Data: Job Name**, **Map** page accessed using the **USER** key.

30.3 Configuring MapView

Description

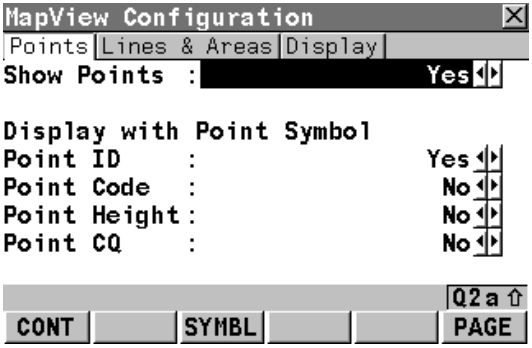
Allows options to be set which are used as default options within MapView. These settings are stored within the configuration set and apply to all **Map** and **Plot** pages, regardless of how MapView is accessed.

Any changes made in **XX MapView Configuration** affect the appearance of MapView in all application programs, not just the active application program.

Access step-by-step

Step	Description
1.	Refer to "30.2 Accessing MapView" to access MapView in map, plot or survey mode.
2.	**SHIFT CONF (F2)** to access **XX MapView Configuration**.

XX MapView Configuration, Points page



CONT (F1)
To confirm the selections and to return to the screen from where this screen was accessed.

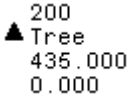
SYMBL (F3)
To view all point symbols and their descriptions.

PAGE (F6)
To change to another page on this screen.

Description of fields

Field	Option	Description
<Show Points:>	**Yes** or **No**	Determines if points are displayed in MapView.
<Point ID:>	**Yes** or **No**	Available for **<Show Points: Yes>**. Determines if the ID of a point is displayed.
<Point Code:>	**Yes** or **No**	Available for **<Show Points: Yes>**. Determines if the code of a point is displayed.
<Point Height:>	**Yes** or **No**	Available for **<Show Points: Yes>**. Determines if the height of a point is displayed.
<Point CQ:>	**Yes** or **No**	Available for **<Show Points: Yes>**. Determines if the coordinate quality of a point is displayed.

Displayable point information



a) **<Point ID:>**
b) **<Point Code:>**
c) **<Point Height:>**
d) **<Point CQ:>**

Next step

PAGE (F6) changes to the **Lines&Areas** page. Refer to paragraph "XX MapView Configuration, Lines&Areas page".

XX
MapView Configuration, Lines&Areas page

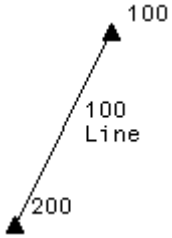
Description of fields

Field	Option	Description
<Show Lines:>	**Yes** or **No**	Determines if lines are displayed in MapView.

Field	Option	Description
<Show Line ID:>	**Yes** or **No**	Available for **<Show Lines: Yes>**. Determines if the ID of a line is displayed.
<Show Line Code:>	**Yes** or **No**	Available for **<Show Lines: Yes>**. Determines if the code of a line is displayed.
<Show Areas:>	**Yes** or **No**	Determines if areas are displayed in MapView.
<Show Area ID:>	**Yes** or **No**	Available for **<Show Areas: Yes>**. Determines if the ID of an area is displayed.
<Show Area Code:>	**Yes** or **No**	Available for **<Show Areas: Yes>**. Determines if the code of an area is displayed.

Displayable line/area information

A line is shown as example.



a) **<Show Line ID:>**
b) **<Show Line Code:>**

Next step

PAGE (F6) changes to the **Display** page. Refer to paragraph "XX MapView Configuration, Display page".

XX MapView Configuration, Display page

Description of fields

Field	Option	Description
<Show Pt Info:>	**When <200 Pts** or **As Configured**	Determines if point information is shown or not. For **<Show Pt Info: When <200 Pts>** point information is not shown when more than 200 points are displayed. For **<Show Pt Info: As Configured>** the point information, as configured in **XX MapView Configuration, Points** page, is shown regardless of the number of points being displayed.
<Rotate 180°:>	**Yes** or **No**	Available for **<Datum View: Local>**. To rotate the map by 180°. The north arrow is not rotated and still orientated towards the top of the screen.
<Toolbar:>	**On** or **Off**	Determines if the toolbar of touch icons are displayed. Refer to "30.4.3 Toolbar".
<Curr Pos Info:>		Determines if a certain information related to the current position is displayed in the lower left corner of the map (only visible in survey mode).
	<None>	No information is displayed in the map.
	Point ID	Point ID of the current position.
	Code	Code of the current position.
	Attrib 01	User defined attribute.
	Attrib 02	User defined attribute.
	Attrib 03	User defined attribute.
	Attrib 04	User defined attribute.

Field	Option	Description
	Attrib 05	User defined attribute.
	Quality 3D	Current 3D coordinate quality of the computed position.
The following fields are relevant for Survey Mode:		
<Show Path:>	**Yes** or **No**	Displays the path of the reflector as a dashed line.
<Center To:>	Choicelist	To centre the map on the reflector or the instrument.
	Reflector	To centre the map on the reflector. For EDM mode standard, fast or average, the map will centre onto the last measured point. For EDM mode tracking or synchrotrack, the map will centre onto the current reflector position. These behaviours are true for all automation settings
	Total Station	To centre the map on the instrument.

Next step

CONT (F1) confirms the selections and returns to where **XX MapView Configuration** was accessed.

30.4 MapView Components

30.4.1 Softkeys

Description

Standard functionality is provided by a number of softkeys within MapView. These softkeys are available regardless of the mode in which MapView was accessed and always perform the same functions.

Standard softkeys

The softkeys described below are standard on all MapView screens. For descriptions of mode specific softkeys see appropriate chapters.

Softkey	Description
ZOOM+ (F4)	To zoom into the map. ☞ Pressing **ESC** stops the zooming process. All keys become active again.
ZOOM- (F5)	To zoom out of the map. ☞ Pressing **ESC** stops the zooming process. All keys become active again.
PAGE (F6)	To change to another page on this screen.
SHIFT CONF (F2)	To configure MapView. Accesses **XX MapView Configuration**. Refer to "30.3 Configuring MapView".
SHIFT FIT (F3)	To fit all displayable data into the screen area. Refer to "30.4.3 Toolbar" for more information.

Touch screen functions

Some softkey functionality can be replaced by touch screen functions.

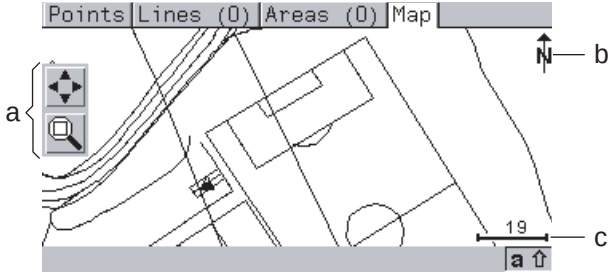
Softkey	Touch equivalent
PAGE (F6)	Tap on a page tab.
SHIFT FIT (F3)	Tap on fit touch icon. Refer to "30.4.3 Toolbar".

30.4.2 Screen Area

Description

The MapView screen area is very similar in all cases. The positions of the scale bar, the North arrow and the toolbar, if visible, do not change.

Standard screen



a) Toolbar
b) North arrow
c) Scale bar

Reflector

Reflectors are displayed on the **Map** page. The reflector path is shown as dashed line.

Symbol	Description
	Measured position.

Instrument station

Symbol	Description
	Position of the instrument station.

Scale bar

Symbol	Description
	Scale of the current screen. The minimum is 0.5 m. There is no maximum for the zoom but the scale cannot display values greater than 99000 m. In this case the value displayed will be >99000 m.

North arrow

Symbol	Description
	North arrow. North is always orientated towards the top of the screen.

Toolbar

Symbol	Description
	Touch icon toolbar. Refer to "30.4.3 Toolbar" for more information about the functionality of the touch icons in the toolbar.

Point with focus

Symbol	Description
	The point that has the focus.

30.4.3 Toolbar

Description

Touch icons are available in a toolbar, if **<Toolbar: On>** in **XX MapView Configuration**, **Display** page. The toolbar is always located on the left hand side of the screen. Some of the functions performed by the touch icons can also be replicated using a softkey in the same mode as when the touch icon appears. The softkey equivalent to each touch icon, if one exists, are indicated below.

Touch icons in the toolbar

Touch icon	Softkey	Description
	SHIFT FIT (F3)	Available as a touch icon in map mode. The fit touch icon fits all displayable data, according to filters and the map configuration, into the screen area, using the largest possible scale.
	-	The windowing touch icon zooms to a specified area window. An area window can be drawn by tapping on the top left and the bottom right corner of the area. This causes the screen to zoom to the selected area.
	-	Available in survey mode. This touch icon displays the current direction as dashed line. A location on the **Map** page can then be tapped and the instrument turns to this direction.

30.4.4 Point Symbols

Points

When **<Show Points: Yes>** in **XX MapView Configuration**, points are displayed, in all modes, according to their class.

Symbol	Description
▲	3D control point is a point of class **CTRL** with horizontal and vertical coordinate components.
▲	2D control point is a point of class **CTRL** with horizontal coordinate components.
◎	Adjusted point is a point of class **ADJ**.
▽	Reference point is a point of class **REF**.
◎	Average point is a point of class **AVGE**.
⊙	Measured point is a point of class **MEAS**.
+	Estimated point is a point of class **EST**.

☞ Points of class **NONE** or points of class **CTRL/MEAS** with a height only component cannot be displayed in MapView.

☞ A list of the point types available, and their description, is available by pressing **SYMBL (F3)** in **XX MapView Configuration**, **Points** page. Refer to "30.3 Configuring MapView".

30.5 Map Mode

30.5.1 MapView in Map Mode

Description

The map mode of MapView is available as the **Map** page in data management and some application programs. It can be used to display, select and edit points, lines and areas.

Access

Refer to "30.2 Accessing MapView" paragraph "Example access for map mode:".

OR

From a choicelist in some screens, for example, in application programs, which access data management.

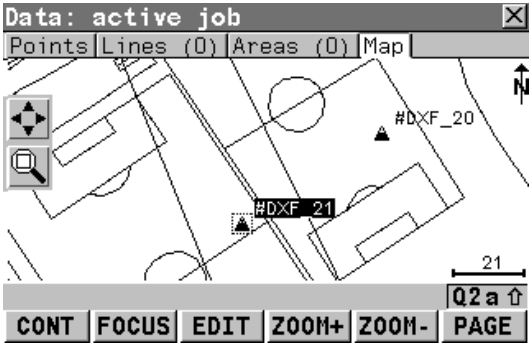
OR

As a part of an application program, for example, COGO.

The **MANAGE Data: Job Name**, **Map** page is used as the example below. The functions described are the same for all **Map** pages in map mode.

MANAGE
Data: Job Name, Map page

The softkeys described below are specific to MapView in map mode. Refer to "30.4.1 Softkeys" for descriptions of the standard softkeys.



FOCUS (F2) or **DONE (F2)**
To activate the focus tool and select a point without using the touch screen. Refer to "30.5.2 Selecting Points, Lines and Areas".

EDIT (F3)
To edit the highlighted point's parameters. Accesses **MANAGE Edit Point: Point ID**.

SHIFT CENTR (F4)
To centre the screen around the point with the current focus, or the focus tool if **DONE (F2)** is visible.

SHIFT FILTR (F5)
Available for **FOCUS (F2)**. To change the filter settings. Accesses **MANAGE Sorts & Filters**.

Touch screen functions

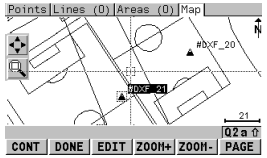
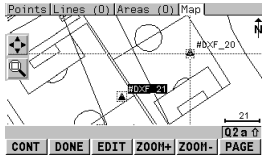
Key	Touch equivalent
FOCUS (F2)	Tap on a point.

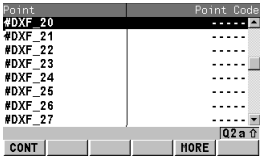
30.5.2 Selecting Points, Lines and Areas

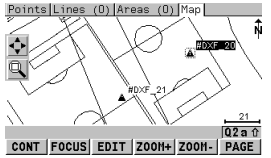
Description

Selecting a point, line or area in the map mode of MapView is possible using both the softkeys and the touch screen. The functionality of all screens and field are similar for the selecting of a point, line or area. The step-by-step instructions for selecting a point using the softkeys can be applied for lines and areas.

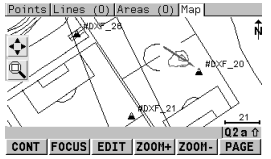
Select a point using the softkeys step-by-step

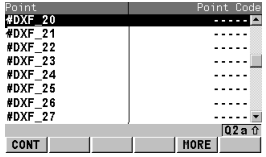
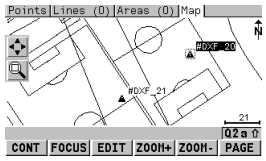
Step	Description	Display
1.	Refer to "30.5.1 MapView in Map Mode" to access **MANAGE Data: Job Name**, **Map** page.	
☞	If no point field is highlighted on the previous page when the **Map** page is accessed, then any point that is selected will be assigned to the first point field on the previous page, the second point to the second point field, etc. If a point field is highlighted when the **Map** page is accessed then the point selected will be assigned to that field.	
2.	**FOCUS (F2)** to activate the focus tool. The focus tool is made up of a square placed at the centre of dashed crosshairs. The focus tool always starts at the centre of the screen area.	
3.	Use the arrow keys to navigate the focus tool to the point to select. A point is available for selection when the square is centred around the point symbol.	

Step	Description	Display
☞	When there are multiple points within the same area and the precise selection is unclear, pressing **ENTER** will access **XX Select Point**.	
4.	Press **ENTER** to select the point. The point parameter text, as defined in **XX Map View Configuration, Points** page, is highlighted.	
5.	Have multiple points been selected? • If **yes**, continue with step 6. • If **no**, continue with step 8.	
6.	**XX Select Point** **Point ID** The ID of the points within range of the point selection. **Point Code** The code of the points within range of the point selection. Select the desired point.	
☞	**MORE (F5)** to display information about the point code, the 3D coordinate quality and class, the time the point was stored and the date the point was stored.	
7.	**CONT (F1)** returns to **MANAGE Data: Job Name**, **Map** page with the focus on the selected point.	

Step	Description	Display
8.	**DONE (F2)** exits the focus tool.	

Selecting a point using the touch screen step-by-step

Step	Description	Display
1.	Refer to "30.5.1 MapView in Map Mode" to access **MANAGE Data: Job Name**, **Map** page.	
☞	If no point field is highlighted on the previous page when the **Map** page is accessed, then any point that is selected will be assigned to the first point field on the previous page, the second point to the second point field, etc. If a point field is highlighted when the **Map** page is accessed then the point selected will be assigned to that field.	
2.	Tap on the point to be selected.	
☞	When there are multiple points within the same area and the precise selection is unclear, tapping on the point will access **XX Select Point**.	
3.	Have multiple points been selected?	

Step	Description	Display
	• If **yes**, continue with step 4. • If **no**, continue with step 6.	
4.	**XX Select Point** **Point ID** The ID of the points within range of the point selection. **Point Code** The code of the points within range of the point selection. Select the desired point.	
☞	**MORE (F5)** to display information about the point code, the 3D coordinate quality and class, the time the point was stored and the date the point was stored.	
5.	**CONT (F1)** returns to **MANAGE Data: Job Name**, **Map** page with the focus on the selected point.	
6.	A square is centred on the selected point and the point parameter text, as defined in **XX MapView Configuration**, **Points** page, is highlighted.	

30.6 Plot Mode - MapView Screen Area

Description

The plot mode of MapView is available as the **Plot** page in an application program and can be used to view the results of the application program. Results are shown in black, all other information, that is displayable, is shown in grey.

Access

Refer to "30.2 Accessing MapView" paragraph "Example access for plot mode:".

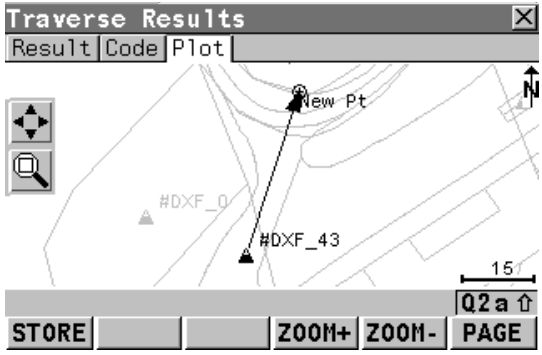
OR

As a part of an application program, for example, COGO.

The **COGO XX Results**, **Plot** page is used as the example below. The functions described are the same for all **Plot** pages.

COGO XX Results, Plot page

The softkeys described below are specific to MapView in plot mode. Refer to "30.4.1 Softkeys" for descriptions of the standard softkeys.



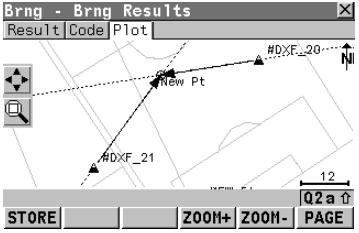
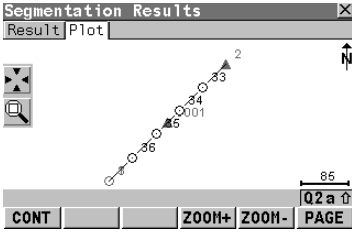
SHIFT FIT R (F4)
To fit the results in the screen area.

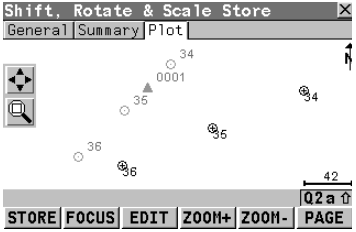
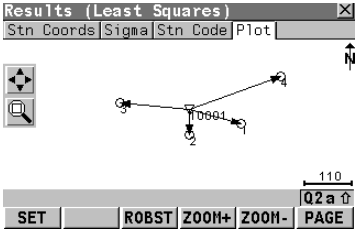
SHIFT RFRSH (F5)
To refresh the screen.

Touch screen functions

Key	Touch Equivalent
SHIFT FIT R (F4)	Tap on fit results touch icon. Refer to "30.4.3 Toolbar".

Example of results displayed in MapView on Plot page

Application	Display	Description
COGO Intersection, Bearing - Bearing		Intersecting lines with known bearings from known points.
COGO line calculation, Segmentation		Points defining the line and those created on the line

Application	Display	Description
COGO Shift, Rotate & Scale		Original points in grey, calculated COGO points in black
Setup		Directions to resection points.

30.7 Survey Mode

30.7.1 MapView in Survey Mode

Description

The survey mode of MapView is available as the Map page in Survey and is used to display the position of the instrument station during a survey. It can also be used to select lines and areas. It is also used by the Stakeout application program to assist in the staking out/measuring of points.

Refer to "30.7.2 MapView in Staking Out Survey Mode" for more information about using MapView when staking out points.

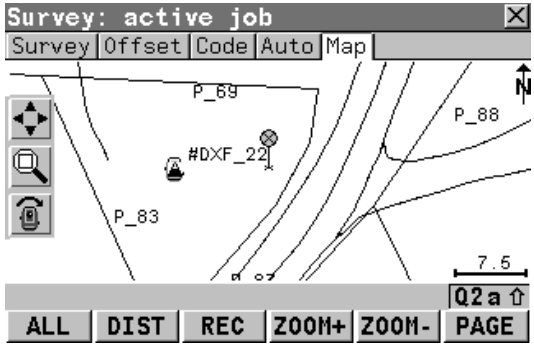
Access

Refer to "30.2 Accessing MapView" paragraph "Example access for survey mode:".

☞ The **SURVEY Survey: Job Name**, **Map** page is used as the example below. The functions described are the same for all **Map** pages in survey mode.

SURVEY
Survey: Job Name, Map page

The softkeys described below are specific to MapView in survey mode. Refer to "30.4.1 Softkeys" for descriptions of the standard softkeys.



SHIFT CENTR (F4)
To centre the screen around the point with the current focus or the focus tool, if **FOCUS (F2)** is active.

SHIFT RFRSH (F5)
To refresh the screen.

Touch screen functions

Key	Touch equivalent
SHIFT CENTR (F4)	Tap on centre touch icon. Refer to "30.4.3 Toolbar".

30.7.2 MapView in Staking Out Survey Mode

Description

When staking out a point in Stakeout application program, the **Map** page is available. The MapView survey mode is provided for this operation, with some differences.

- With the RC9 active points can be selected, using the touch screen, as points to be staked.
- An arrow indicating the direction from the current position to the point to be staked is provided.
- A box provides information such as the distance to the stakeout point and the CUT/FILL value so the point to be staked can be found.

Data displayed

For Stakeout application program.

- From **<Job:>** and **<Stakeout Job:>**, all point symbols are shown in green, point ID's in black and displayable lines and areas in a colour defined in **MANAGE New Line** or **MANAGE Edit Line**.
- If the survey is to be orientated to a reference line/arc, the line is displayed in black.

The **STAKEOUT XX Stakeout**, **Map** page is used as the example below. The functions described are the same for all **Map** pages available when staking out.

Access step-by-step

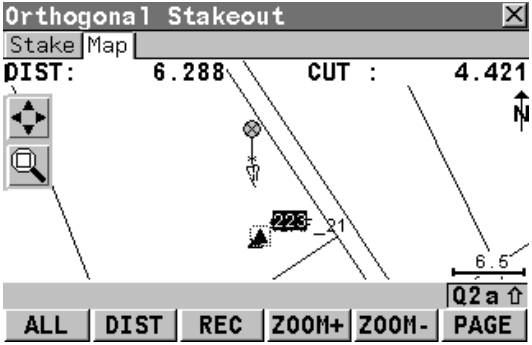
Example access for MapView in survey mode, Stakeout

Step	Description
1.	Select **Main Menu: Programs...\Stakeout**. OR Press **ON**. Highlight **Stakeout**. **CONT (F1)**. OR

Step	Description
	Press **USER**. Refer to "2 USER Key" for information on the **USER** key. OR Press **STAKE (F5)** from another application program, for example COGO.
2.	**CONT (F1)** to access **STAKEOUT XX Stakeout**.
3.	**PAGE (F6)** until **STAKEOUT XX Stakeout**, **Map** page is active.

STAKEOUT XX Stakeout, Map page

The softkeys described below are specific to MapView in survey mode, staking out. Refer to "30.4.1 Softkeys" for descriptions of the standard softkeys.



SHIFT CENTR (F4)
To centre the screen around the reflector.

Description of fields

Field	Option	Description
<DIST:>	Output	Horizontal distance from the current position to the point to be staked.
<CUT:>	Output	The negative height difference from the height of the current position to the height of the point to be staked.
<FILL:>	Output	The positive height difference from the height of the current position to the height of the point to be staked.

30.7.3 Selecting Lines and Areas

Description

Selecting a line or area in the survey mode of MapView is possible using the touch screen. The functionality of all screens and field are similar for the selecting of a line or area. The step-by-step instructions for selecting a line using the touchscreen can be applied for areas.

Selecting a line step-by-step

Step	Description
1.	Select **Main Menu: Survey**. OR Select **Main Menu: Programs...\Survey**. OR Press **USER**. Refer to "2 USER Key" for information on the **USER** key. OR Press **ON**. Highlight Survey. **CONT (F1)**. Refer to "31.2 Accessing the Programs Menu" for information on the **ON** key.
2.	**PAGE (F6)** until **SURVEY XX Survey**, **Map** page is active.
3.	Tap on the line to be selected. When there are multiple lines within the same area and the precise selection is unclear, tapping on the line will access **XX Select Line**.
4.	Have multiple lines been selected ? • If **yes**, continue with step 5. • If **no**, continue with step 7.
5.	**XX Select Line**

Step	Description
	Point ID The ID of the lines within range of the line selection. **Point Code** The code of the lines within range of the point selection. Select the desired line.
☞	**MORE (F5)** to display information about the line code, the start time, the end time, the length and the Open status of the line.
6.	**CONT (F1)** returns to **SURVEY Data: Job Name**, **Map** page.
7.	A message appears in the message line. • Line Line Name was opened (If the line was close before). • Line Line Name was closed (If the line was open before).

31 Application Programs - General

31.1 Overview

Description

Application programs are software packages supporting specific tasks. Available are:

- Survey (integrated into the instrument firmware and cannot be deleted)
- Setup (integrated into the instrument firmware and cannot be deleted)
- COGO
- Stakeout

For an explanation of the application programs refer to the relevant chapters.

Loadable and non-loadable application programs

Loadable application programs:
- Can be loaded onto the instrument.
- Can be deleted from the instrument.

Non-loadable application programs:
- Are always available on the instrument.
- Survey and Setup are non-loadable application programs. To get updates for these programs, the system software has to be reloaded.

31.2 Accessing the Programs Menu

Description

The application programs menu contains all loaded application programs including Survey and Setup. They are listed in the order in which they were loaded. Selecting an option in the menu starts the application program assigned to the option. Configurations and measurements that can be performed depend on the application program.
The screen of the application programs menu is called **R9 Programs**.

Access to the application programs menu

Select **Main Menu: Programs...**.
OR
Press **ON**.

R9 Programs

CONT (F1)
To start the highlighted application program.

Next step
Select an option in the menu to open the application. Refer to the chapter on the individual application programs.

Four application programs can be open at one time. **XX Begin** is shown for the application program opened first, but not for the following application programs.

32 COGO

32.1 Overview

Description

COGO is an application program to perform **co**ordinate **ge****o**metry calculations such as

- coordinates of points.
- bearings between points.
- distances between points.

The calculations can be made from

- existing point data in the job, known distances or known azimuths.
- measured points.
- entered coordinates.

In contrast to remote point measurements within the Survey application program, COGO is more of a calculation program than a measuring program.

Changing coordinates of a point which has been previously used in COGO does not result in the point being recomputed.

COGO calculation methods

The COGO calculation methods are:

- Inverse.
- Traverse.
- Intersections.
- Line calculations.
- Arc calculations.
- Shift, Rotate & Scale (Manual)
- Shift, Rotate & Scale (Match Pts)
- Area Division

Distances and azimuths

Type of distances: Grid
Type of azimuths: The azimuths are grid azimuths relative to the local grid.

Coding of COGO points

- Thematical coding is available in **COGO XX Results** after the COGO calculation. Thematical coding of COGO points is identical to coding measured points. Refer to "9 Coding" for information on coding.
- For the COGO calculation shift, rotate & scale, the codes from the original points are taken over for the calculated COGO points.

Properties of COGO points

The properties stored with COGO points are:

- Class: Either **MEAS** or **CTRL** depending on the COGO calculation method.
- Sub class: **COGO**
- Source: **Arc Base Pt**, **Arc Centre Pt**, **Arc Offset Pt**, **Arc Segmt Pt**, **COGO Area Divsn.**, **COGO Shift/Rtn**, **COGO Traverse**, **Intsct (Brg Brg)**, **Intsct (Brg Dst)**, **Intsct (Dst Dst)**, **Intsct (4 Pts)**, **Line Base Pt**, **Line Offset Pt** or **Line Segmt Pt** depending on the COGO calculation method used
- Instrument source: **TPS**

32.2 Accessing COGO

Access

Select **Main Menu: Programs...\COGO**.

OR

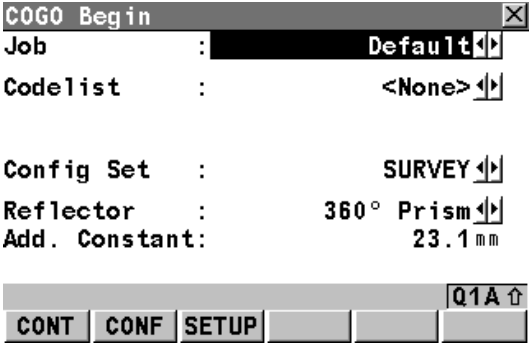
Press **ON**. Highlight **COGO**. **CONT (F1)**. Refer to "31.2 Accessing the Programs Menu" for information on the **ON** key.

OR

Press **USER**. Refer to "2 USER Key" for information on the **USER** key.

The screens for each COGO calculation method can be accessed directly by pressing **USER** where **COGO COGO Begin** is not accessed. The currently active configuration set and job are used.

COGO
COGO Begin



CONT (F1)
To accept changes and access the subsequent screen. The chosen settings become active.

CONF (F2)
To configure the COGO application program. Accesses **COGO Configuration**. Refer to "32.3 Configuring COGO".

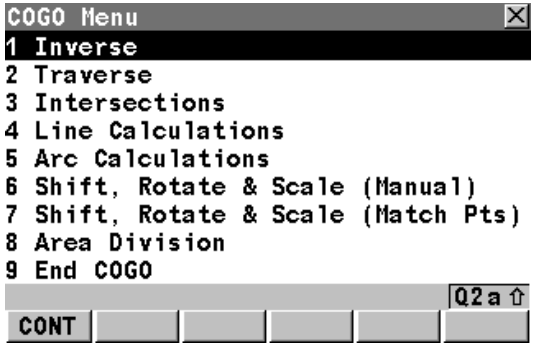
SETUP (F3)
To set up station. Accesses **SETUP Station Setup**.

Description of fields

Field	Option	Description
<Job:>	Choicelist	The active job. All jobs from **Main Menu: Manage...\Jobs** can be selected.
<Codelist:>	Choicelist	No codes are stored in the selected **<Job:>**. All codelists from **Main Menu: Manage...\Codelists** can be selected.
	Output	Codes have already been stored in the selected **<Job:>**. If codes had been copied from a System RAM codelist, then the name of the codelist is displayed. If codes have not been copied from a System RAM codelist but typed in, then the name of the active job is displayed.
<Config Set:>	Choicelist	The active configuration set. All configuration sets from **Main Menu: Manage...\Configuration Sets** can be selected.
<Reflector:>	Choicelist	The active reflector. All reflectors from **Main Menu: Manage...\Reflectors** can be selected.
<Add. Constant:>	Output	The additive constant stored with the chosen reflector.

Next step
CONT (F1) accepts changes and accesses **COGO COGO Menu**.

The COGO menu lists all COGO calculation methods and the option to end COGO.



CONT (F1)
To select the highlighted option and to continue with the subsequent screen.

SHIFT CONF (F2)
To configure the COGO application program. Accesses **COGO Configuration**. Refer to "32.3 Configuring COGO".

Description of the COGO menu options

COGO menu options	Description	Refer to chapter
Inverse	To calculate the direction, the distance and the 3D coordinate differences between: • two known points, • a known point and a given line, • a known point and a given arc. Points with full coordinate triplets, position only points and height only points can be used.	32.4
Traverse	To calculate the position of new points using	32.5

COGO menu options	Description	Refer to chapter
	• the azimuth/bearing and the distance from a known point. Offset optional. • the angle and the distance from a known point. Offset optional. Points with full coordinate triplets and position only points can be used.	
Intersections	To calculate the position of an intersection point using • bearings from two known points. • a bearing and a distance from two known points. • distances from two known points. • four points. • two lines Points with full coordinate triplets and position only points can be used.	32.6
Line Calculations	To calculate the base point of the line using • two known points and an offset point. • a bearing and a distance from a known point and an offset point. To calculate the offset point of the line using	32.7

COGO menu options	Description	Refer to chapter
	• two known points that define the line, a distance along the line and an offset. • a distance along a bearing from a known point and offset. To calculate new points on a line using • two known points that define the line and either the segment length or the number of segments. • a bearing and distance from a known point that define the line and either the segment length or the number of segments.	
Arc Calculations	To calculate: • the arc centre. • the base point of the arc. • the offset point of the arc. • new points on an arc. The arc can be defined using • three points. • a radius to two known points. • a radius and two tangents, each of it defined by a point and the intersection point of the tangents.	32.8

COGO menu options	Description	Refer to chapter
	• the length of an arc and two tangents, each of it defined by a point and the intersection point of the tangents. • the length of a chord and two tangents, each of it defined by a point and the intersection point of the tangents. Known must be also, depending on the arc calculation method • an offset point. • either the segment length or the number of segments.	
Shift, Rotate & Scale (Manual)	To calculate the position of new points using • coordinates of known points • shifts. • rotation. • scale. Heights are not scaled. The values for shifts, rotation and/or scale are entered manually. Points with full coordinate triplets, position only points and height only points can be used.	32.9

COGO menu options	Description	Refer to chapter
Shift, Rotate & Scale (Match Pts)	To calculate the coordinates of new points using the shifts, rotation and scale computed from selected points. Points with full coordinate triplets, position only points and height only points can be used.	32.10
Area Division	To divide an area by a • defined line • percentage • size of a sub area.	32.11
End COGO	To end COGO and return to the screen from where COGO was accessed.	

Next step

IF	THEN
a COGO calculation method is to be started	highlight the relevant option and press **CONT (F1)**. Refer to the chapters stated above.
COGO is to be configured	**SHIFT CONF (F2)**. Refer to "32.3 Configuring COGO".
COGO is to be ended	highlight **End COGO** and **CONT (F1)**.

32.3 Configuring COGO

Access

Select **Main Menu: Programs...\COGO**. In **COGO COGO Begin** press **CONF (F2)** to access **COGO Configuration**.

OR

Press **ON**. Highlight **COGO**. **CONT (F1)**. In **COGO COGO Begin** press **CONF (F2)** to access **COGO Configuration**.

OR

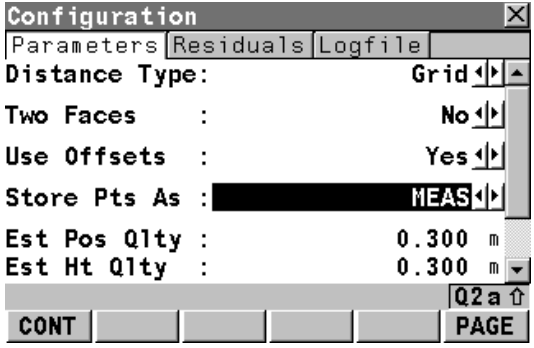
Press **SHIFT CONF (F2)** in **COGO COGO Menu**. Refer to "32.2 Accessing COGO".

OR

Press **SHIFT CONF (F2)** in **COGO XX**.

COGO Configuration, Parameters page

This screen consists of the **Parameters** page, **Residuals** page and the **Logfile** page. The explanations for the softkeys given below are valid for all pages.



CONT (F1)
To accept changes and return to the screen from where this screen was accessed.

PAGE (F6)
To change to another page on this screen.

SHIFT ABOUT (F5)
To display information about the program name, the version number, the date of the version, the copyright and the article number.

Description of fields

Field	Option	Description
<Distance Type:>		The type of distances and offsets to be accepted as input, shown as output and used in the calculation.
	Grid	Distances are calculated as the trigonometric distance between the position of two points. The distance field is **<HDist-Grid:>**.
<Two Faces:>		Defines if the instrument measures the second face automatically after storing the first.
	Yes	After storing a measurement with **ALL (F1)** or **REC (F3)** motorised instruments change face automatically. The measurements of face I and face II are averaged on the base of face I. The averaged value is stored.
	No	No automatic measurement in two faces.
<Use Offsets:>	**Yes** or **No**	Activates the use of offsets in the COGO calculations. Input fields for the offsets are available in **COGO XX**.
<Store Pts As:>	**MEAS** or **CTRL**	To store the cogo point with point class MEAS or with point class CTRL. Points stored with point class MEAS can be stored with the same point ID. The averaging functionality (configured under job management) can then be used to calculate an average for these points.

Field	Option	Description
		Points stored with point class CTRL can only be stored with a unique point ID. A message is always displayed when a point is about to be stored with an already existing point ID. The user can then decide to either keep the existing point or overwrite the existing point.
<Est Pos Qlty:>	User input	The estimated value for the position quality assigned to all calculated COGO points which is used for the averaging calculation.
<Est Ht Qlty:>	User input	The estimated value for the height quality assigned to all calculated heights which is used for the averaging calculation.
When the Intersections **<Method: TPS Obs-TPS Obs>**, the following fields apply:		
<Compute Ht:>	Output text	Defines the height being used.
	Using Average	Using an average of the two observations.
	Use Upper Height	Using the upper height.
	Use Lower Height	Using the lower height.

Next step

PAGE (F6) changes to the **Residuals** page. Refer to paragraph "COGO Configuration, Residuals page".

COGO Configuration, Residuals page

This page applies to COGO Shift, Rotate & Scale (Match Pts).

Description of fields

Field	Option	Description
<Easting:>	User input	The limit above which Easting residuals will be flagged as possible outliers.
<Northing:>	User input	The limit above which Northing residuals will be flagged as possible outliers.
<Height:>	User input	The limit above which Height residuals will be flagged as possible outliers.
<Residual Distbtn:>		The method by which the residuals of the control points will be distributed throughout the transformation area.
	None	No distribution is made. Residuals remain with their associated points.
	1/Distance[XX]	Distributes the residuals according to the distance between each control point and the newly transformed point.
	Multiquadratic	Distributes the residuals using a multiquadratic interpolation approach.

Next step

PAGE (F6) changes to the **Logfile** page. Refer to paragraph "COGO Configuration, Logfile page".

Description of fields

Field	Option	Description
<Write Logfile:>	**Yes** or **No**	To generate a logfile when the application program is exited. A logfile is a file to which data from an application program is written to. It is generated using the selected **<Format File:>**.
<File Name:>	Choicelist	Available for **<Write Logfile: Yes>**. The name of the file to which the data should be written. A logfile is stored in the \DATA directory of the active memory device. The data is always appended to the file. Opening the choicelist accesses **XX Logfiles** where a name for a new logfile can be created and an existing logfile can be selected or deleted.
<Format File:>	Choicelist	Available for **<Write Logfile: Yes>**. A format file defines which and how data is written to a logfile. Format files are created using Stonex® Tools. A format file must first be transferred from the CompactFlash card to the System RAM before it can be selected. Refer to "22 Tools...\Transfer Objects..." for information on how to transfer a format file. Opening the choicelist accesses **XX Format Files** where an existing format file can be selected or deleted.

Next step
PAGE (F6) changes to the first page on this screen.

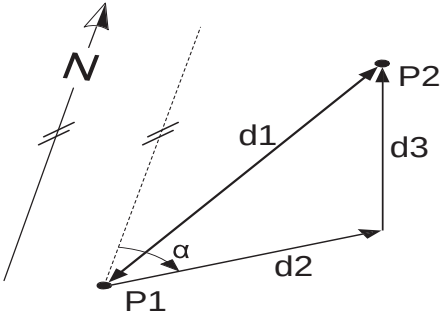
<Azimuth:> is used throughout this chapter. This should always be considered to also mean **<Bearing:>**.

32.4 COGO Calculation - Inverse Method

32.4.1 Overview

Description

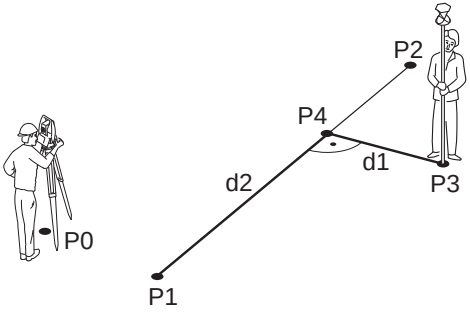
It is possible to compute an inverse result between point, line and arc elements:



Option 1: inverse between point - point

To compute an inverse between two known points.

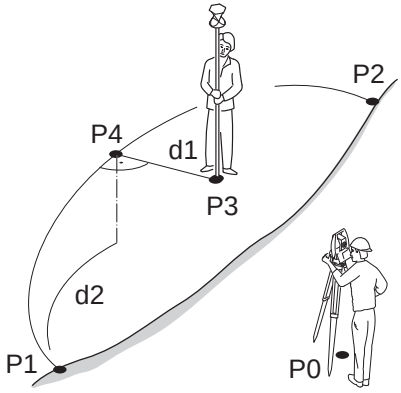
Known elements:
P1 First known point (From)
P2 Second known point (To)
Unknown elements:
α Direction from P1 to P2
d1 Slope distance between P1 and P2
d2 Horizontal distance between P1 and P2
d3 Height difference between P1 and P2



Option 2: inverse between point - line

To compute an inverse between a known point and a given line (the inverse is computed as the perpendicular between the known point and the given line).

Known elements:
P0 Instrument station
P1 Starting point
P2 End point or the direction from P1 to P2
P3 Offset point
Unknown elements:
P4 Base point
d1 The perpendicular offset to the base point
d2 The distance along the line



Option 3: inverse between point - arc

To compute an inverse between a known point and a given arc (the inverse is computed as the perpendicular between the known point and the given arc).

Known elements:

P0 Instrument station
P1 Starting point
P2 End point
P3 Offset point
P4 Second point or arc radius or arc/chord length

Unknown elements:

P4 Base point
d1 The perpendicular offset to the base point
d2 The distance along the arc

The coordinates of the points must be known. The points:

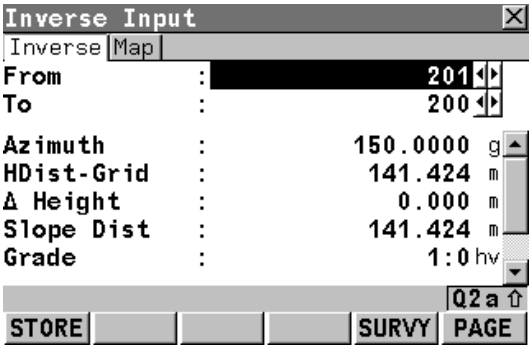
- may be taken from the active job.
- may be measured during the COGO calculation.
- may be entered manually.

32.4.2 Inverse Between Two Known Points (Pt - Pt)

Starting step-by-step

Step	Description
1.	COGO Menu 1 Inverse 2 Traverse 3 Intersections
2.	COGO Inverse 1 Inverse Pt - Pt 2 Inverse Pt - Line 3 Inverse Pt - Arc

Calculating



STORE (F1)
To store the result.

SURVY (F5)
To measure a known point for the calculation.

SHIFT CONF (F2)
To configure the program.

PAGE (F6)
To change to another page on the screen.

Description of fields

Field	Option	Description
<From:> or **<To:>**	Choicelist	The point ID of the two known points. To type in coordinates for a known point open the choicelist. Press **NEW (F2)** to create a new point.
<Azimuth:>	Output	The direction from the first point to the second point.
<HDist-XX:>	Output	The horizontal distance between the two points.
<ΔHeight:>	Output	The height difference between the two points.
<Slope Dist:>	Output	The slope distance between the two points.
<Grade:>	Output	The grade between the two points.
<ΔEasting:>	Output	The difference in Easting between the two points.
<ΔNorthing:>	Output	The difference in Northing between the two points.

Storing the results step-by-step

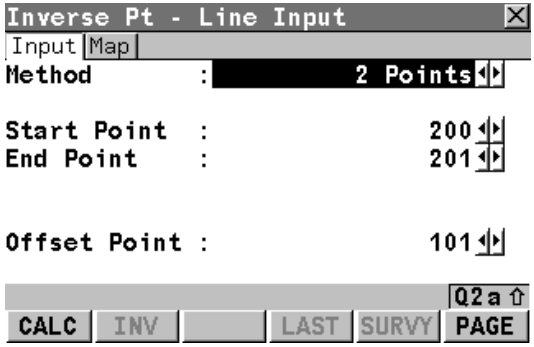
Step	Description
1.	Press **STORE (F1)** to store the inverse result to the active job. There are no points stored to the database, only the inverse result.
2.	Inverse results can be exported from the job using a format file. The format file is created with Format Manager in Stonex® Tools.

32.4.3 Inverse Between a Known Point and a Line (Pt - Line)

Starting step-by-step

Step	Description
1.	COGO Menu 1 Inverse 2 Traverse 3 Intersections
2.	COGO Inverse 1 Inverse Pt - Pt 2 Inverse Pt - Line 3 Inverse Pt - Arc

Calculating



CALC (F1)
To calculate the result.

INV (F2)
To calculate the inverse between two points.

LAST (F4)
To select the values for distance and offset from previous COGO inverse calculations.

SURVY (F5)
To measure a known point for the calculation.

SHIFT CONF (F2)
To configure the program.

SHIFT MODIF (F4)
To modify the original azimuth, distance or offset value.

PAGE (F6)
To change to another page on the screen.

Description of fields

Field	Option	Description
<Method:>		**2 Points** or **Pt/Brg/Dist**. The method for calculating the inverse result.
<Start Point:>	Choicelist	The point ID defining the start of the line.
<End Point:>	Choicelist	The point ID defining the end of the line.
<Azimuth:>	Output	The direction from the first point to the second point.
<HDist-XX:>	Output	The horizontal distance between the two points.
<Offset Point:>	Choicelist	The point ID defining an offset to the line.

Storing the results step-by-step

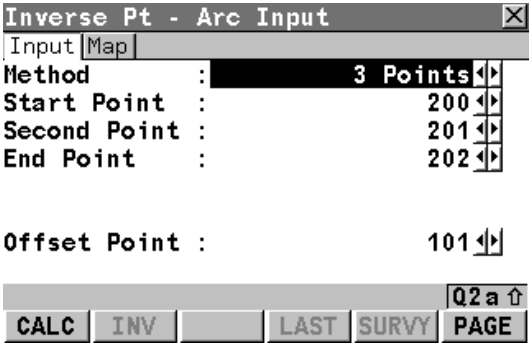
Step	Description
1.	Press **CALC (F1)** to calculate the inverse result and move to the results screen.
2.	Press **STORE (F1)** to store the inverse result to the active job. There are no points stored to the database, only the inverse result.
3.	Inverse results can be exported from the job using a format file. The format file is created with Format Manager in Stonex® Tools.

32.4.4 Inverse Between a Known Point and an Arc (Pt - Arc)

Starting step-by-step

Step	Description
1.	COGO Menu 1 Inverse 2 Traverse 3 Intersections
2.	COGO Inverse 1 Inverse Pt - Pt 2 Inverse Pt - Line 3 Inverse Pt - Arc

Calculating



CALC (F1)
To calculate the result.

INV (F2)
To calculate the inverse between two points.

LAST (F4)
To select the values for distance and offset from previous COGO Inverse calculations.

SURVY (F5)
To measure a known point for the calculation.

SHIFT CONF (F2)
To configure the program.

SHIFT MODIF (F4)
To modify the original azimuth, distance or offset value.

PAGE (F6)
To change to another page on the screen.

Description of fields

Field	Option	Description
<Method:>		**3 Points** or **2 Points/Radius** or **2 Tgnts/Radius** or **2 Tgnts/Arc Lngt** or **2 Tgnts/Chrd Lngt**. The method for calculating the inverse result.
<Start Point:>	Choicelist	The point ID defining the start of the arc.
<Second Point:>	Choicelist	The point ID defining a second point on the arc.
<End Point:>	Choicelist	The point ID defining the end of the arc.
<Arc Length:>	User Input	The arc length.
<Azimuth:>	Output	The direction from the first point to the second point.
<Chord Length:>	User Input	The chord length of the arc.
<HDist-XX:>	Output	The horizontal distance between the two points.
<Offset Point:>	Choicelist	The point ID defining an offset to the arc.
<PI Point:>	Choicelist	The point ID defining the intersection of the tangents.
<Point 1:>	Choicelist	The point ID (with PI Point) defining the 1st tangent.
<Point 2:>	Choicelist	The point ID (with PI Point) defining the 2nd tangent.
<Radius:>	User Input	The radius of the arc.

Storing the results step-by-step

Step	Description
1.	Press **CALC (F1)** to calculate the inverse result and move to the results screen.
2.	Press **STORE (F1)** to store the inverse result to the active job. There are no points stored to the database, only the inverse result.
3.	Inverse results can be exported from the job using a format file. The format file is created with Format Manager in Stonex® Tools.

32.5 COGO Calculation - Traverse Method

32.5.1 Overview

Description

Elements that must be known are
- the coordinates of one point.
- the direction from the known point to the COGO point.
- the distance from the known point to the COGO point.
- offsets, if required and configured.

The coordinates of the known point
- may be taken from the active job.
- may be measured during the COGO calculation.
- may be entered.

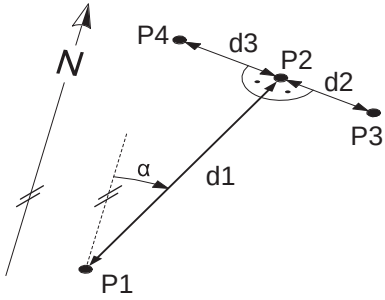
The direction from the known point to the COGO point can be an azimuth or an angle.

Points with full coordinate triplets and position only points can be used. Position only is calculated, height can be typed in.

A COGO traverse calculation can be calculated for
- a single point.
- multiple points. Several single points are calculated in one sequence.
- sideshots.

Diagram

COGO traverse calculation with offset for a single point



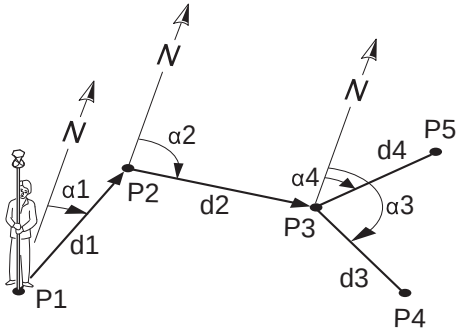
Known

P1 Known point
α Direction from P1 to P2
d1 Distance between P1 and P2
d2 Positive offset to the right
d3 Negative offset to the left

Unknown

P2 COGO point without offset
P3 COGO point with positive offset
P4 COGO point with negative offset

COGO traverse calculation without offset for multiple points



Known

P1 Known point
α1 Direction from P1 to P2
α2 Direction from P2 to P3
α3 Direction from P3 to P4
α4 Direction from P3 to P5
d1 Distance between P1 and P2
d2 Distance between P2 and P3
d3 Distance between P3 and P4
d4 Distance between P3 and P5

Unknown

P2 First COGO point
P3 Second COGO point
P4 Third COGO point - sideshot
P5 Fourth COGO point

32.5.2 Traverse with Azimuth/Bearing

COGO traverse calculation with azimuth/bearing step-by-step

The following table explains the most common settings. Refer to the stated chapter for more information on screens.

Step	Description	Refer to chapter
1.	Refer to "32.2 Accessing COGO" to access **COGO Traverse Input**.	
☞	**COGO Traverse Input**, **Input** page **SHIFT CONF (F2)** to configure the COGO application program.	32.3
2.	**COGO Traverse Input**, **Input** page **<Method: Azimuth>** **<From:>** The point ID of the known point for the COGO calculation. Select a point to be used.	
☞	**SURVY (F5)** when **<From:>** is highlighted. To measure a known point for the COGO calculation.	35.2
☞	For all point fields, the MapView interactive display on the **Map** page can be used to select the desired point.	30.5
☞	To type in coordinates for a known point open the choicelist when **<From:>** is highlighted. Press **NEW (F2)** to create a new point.	7.3.2
3.	**COGO Traverse Input**, **Input** page **<Azimuth:>** The direction from the known point to the COGO point. **<HDist-XX:>** The horizontal distance between the known point and the COGO point.	

Step	Description	Refer to chapter
	<Offset:> Available for **<Use Offsets: Yes>** in **COGO Configuration**, **Parameters** page. The offset of the COGO point from the line of direction. A positive offset is to the right, a negative offset is to the left. Type in the azimuth, the distance and the offset, if required.	
☞	The values for the azimuth, the distance and the offset can be calculated from two existing points. **INV (F2)** when **<Azimuth:>**, **<HDist-XX:>** or **<Offset:>** is highlighted. To perform a COGO inverse calculation. ☞ Upon pressing **STORE (F1)** in **COGO Inverse**, the result from the COGO inverse calculation is copied to the field which was highlighted when **INV (F2)** was pressed. ☞ For **<Write Logfile: Yes>** in **COGO Configuration**, **Logfile** page the result of the COGO inverse calculation is written to the logfile.	32.4
☞	The values for the azimuth, the distance and the offset can be selected from previous COGO inverse calculations. **LAST (F4)** when **<Azimuth:>**, **<HDist-XX:>** or **<Offset:>** is highlighted. To recall previous results from COGO inverse calculations. Upon pressing **CONT (F1)** in **COGO Last Inverse Calculations**, the selected result is copied to the field which was highlighted when **LAST (F4)** was pressed.	32.12
☞	The values for the azimuth, the distance and the offset can be mathematically modified.	32.13

Step	Description	Refer to chapter
	SHIFT MODIF (F4) when **<Azimuth:>**, **<HDist-XX:>** or **<Offset:>** is highlighted. To add, subtract, multiply and divide values.	
4.	Is the COGO point a foresight? • If **yes**, **CALC (F1)**. The result is calculated and displayed in **COGO Traverse Results**. After storing the result and returning to **COGO Traverse Input**, **Input** page, the point displayed in **<From:>** is the newly calculated COGO point. The next COGO calculation can be continued from this new point. • If **no**, **SSHOT (F3)**. The result is calculated and displayed in **COGO Traverse Results**. After storing the result and returning to **COGO Traverse Input**, **Input** page, the point originally selected in **<From:>** is still displayed. The next COGO calculation can be continued from that same point.	
5.	**COGO Traverse Results**, **Result** page **<Point ID:>** The identifier for the COGO point depending on the point ID template configured for **<Survey Pts:>** in **CONFIGURE ID Templates**. The point ID can be changed. The calculated coordinates are displayed. Type in a point ID.	15.1

Step	Description	Refer to chapter
☞	**STAKE (F5)** to access the Stakeout application program and stake out the calculated COGO point. After staking and storing the COGO point, **COGO Traverse Results**, **Result** page is displayed.	34.4
☞	**SHIFT INDIV (F5)** for an individual point ID independent of the ID template. **SHIFT RUN (F5)** changes back to the next ID from the configured ID template.	15.1
6.	**PAGE (F6)** changes to the **Code** page.	
7.	**COGO Traverse Results**, **Code** page **<Code:>/<Point Code:>** The thematical code. All codes of the job can be selected. Type in a code if required.	9 and 7.3.2
8.	**PAGE (F6)** changes to the **Plot** page.	
9.	**COGO Traverse Results**, **Plot** page An arrow points from the known point to the calculated COGO point.	30.6
☞	**SHIFT QUIT (F6)** does not store the COGO point and exits COGO calculations.	
10.	**STORE (F1)** to store the result and return to **COGO Traverse Input**, **Input** page.	
☞	For **<Write Logfile: Yes>** in **COGO Configuration**, **Logfile** page the result is written to the logfile.	

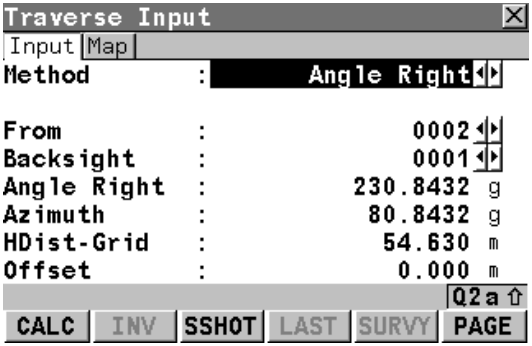
Step	Description	Refer to chapter
11.	Are more COGO traverse calculations to be made? • If **yes**, repeat steps 2. to 11. • If **no**, continue with step 12.	
12.	**SHIFT QUIT (F6)** to exit COGO calculation.	

32.5.3 Traverse with Angle Right

Access

Refer to "32.2 Accessing COGO" to access **COGO Traverse Input**.

COGO Traverse Input, Input page



CALC (F1)
To calculate the COGO point.

INV (F2)
To calculate the values for the distance and the offset from two existing points. Available if **<HDist-XX:>** or **<Offset:>** is highlighted.

SSHOT (F3)
To calculate the point as a sideshot.

LAST (F4)
To select the values for the distance and the offset from previous COGO inverse calculations. Available if **<HDist-XX:>** or **<Offset:>** is highlighted.

SURVY (F5)
To measure a point for the COGO calculation. Available if **<From:>** or **<Backsight:>** is highlighted.

SHIFT CONF (F2)
To configure the COGO application program.

SHIFT MODIF (F4)
To mathematically modify the values for the angle right, the distance and the offset. Available if **<Angle Right:>, <HDist-XX:>** or **<Offset:>** is highlighted.

Description of fields

Field	Option	Description
<Method:>	**Angle Right**	The direction from the known point to the COGO point is an angle.
<From:>	Choicelist	The point ID of the known point for the COGO calculation.
<Backsight:>	Choicelist	The point ID of a point used as backsight.
<Angle Right:>	User input	The angle between **<Backsight:>** and the new COGO point to be calculated from the point selected as **<From:>**. A positive value is for clockwise angles. A negative value is for counterclockwise angles.
<Azimuth:>	Output	The direction from the known point to the COGO point calculated from **<Angle Right:>**.
<HDist-XX:>	User input	The horizontal distance between the known point and the COGO point.
<Offset:>	User input	The offset of the COGO point from the line of direction. A positive offset is to the right, a negative offset is to the left.

Next step

The work flow is very similar to a COGO traverse calculation with azimuth/bearing. Refer to "32.5.2 Traverse with Azimuth/Bearing".

32.6 COGO Calculation - Intersections Method

32.6.1 Intersection with Bearing - Bearing

Description

The COGO intersection calculation bearing - bearing calculates the intersection point of two lines. A line is defined by a point and a direction.

Elements that must be known are

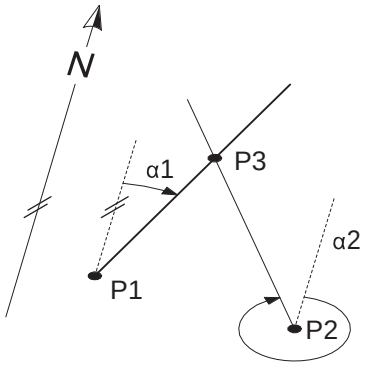
- the coordinates of two points.
- the direction from these known points to the COGO point.
- offsets if required and configured.

The coordinates of the known points

- may be taken from the active job.
- may be measured during the COGO calculation.
- may be entered.

Points with full coordinate triplets and position only points can be used. Position only is calculated, height can be typed in.

Diagram



Known
P1 First known point
P2 Second known point
α1 Direction from P1 to P3
α2 Direction from P2 to P3
Unknown
P3 COGO point

COGO intersection calculation with bearing - bearing step-by-step

The following table explains the most common settings. Refer to the stated chapter for more information on screens.

Step	Description	Refer to chapter
1.	Refer to "32.2 Accessing COGO" to access **COGO Intersection Input**.	
☞	**COGO Intersection Input**, **Input** page **SHIFT CONF (F2)** to configure the COGO application program.	32.3
2.	**COGO Intersection Input**, **Input** page **<Method: Brng - Brng>** **<1st Point:>** The point ID of the first known point for the COGO calculation. Select the point stored in the job.	

Step	Description	Refer to chapter
☞	**SURVY (F5)** when **<1st Point:>** is highlighted. To measure a point for the COGO calculation.	35.2
☞	For all point fields, the MapView interactive display on the **Map** page can be used to select the desired point.	30.5
☞	To type in coordinates for a known point open the choicelist when **<1st Point:>** is highlighted. Press **NEW (F2)** to create a new point.	7.3.2
3.	**COGO Intersection Input**, **Input** page **<Azimuth:>** The direction from the first known point to the COGO point. **<Offset:>** Available for **<Use Offsets: Yes>** in **COGO Configuration**, **Parameters** page. The offset of the COGO point from the line of direction. A positive offset is to the right, a negative offset is to the left. Type in the azimuth and the offset, if required.	
☞	The values for the azimuth and the offset can be calculated from two existing points. **INV (F2)** when **<Azimuth:>** or **<Offset:>** is highlighted. To perform a COGO inverse calculation. ☞ Upon pressing **STORE (F1)** in **COGO Inverse**, the result from the COGO inverse calculation is copied to the field which was highlighted when **INV (F2)** was pressed. ☞ For **<Write Logfile: Yes>** in **COGO Configuration**, **Logfile** page the result of the COGO inverse calculation is written to the logfile.	32.4

Step	Description	Refer to chapter
☞	The values for the azimuth and the offset can be selected from previous COGO inverse calculations. **LAST (F4)** when **<Azimuth:>** or **<Offset:>** is highlighted. To recall previous results from COGO inverse calculations. Upon pressing **CONT (F1)** in **COGO Last Inverse Calculations**, the selected result is copied to the field which was highlighted when **LAST (F4)** was pressed.	32.12
☞	The values for the azimuth and the offset can be mathematically modified. **SHIFT MODIF (F4)** when **<Azimuth:>** or **<Offset:>** is highlighted. To add, subtract, multiply and divide values.	32.13
4.	**COGO Intersection Input**, **Input** page The procedure to input the second known point and the azimuth is identical to the procedure for the first known point. Repeat steps 2. and 3.	
5.	**CALC (F1)** to calculate the result.	
6.	**COGO Brng - Brng Results**, **Result** page **<Point ID:>** The identifier for the COGO point depending on the point ID template configured for **<Survey Pts:>** in **CONFIGURE ID Templates**. The point ID can be changed. The calculated coordinates are displayed. Type in a point ID.	15.1

Step	Description	Refer to chapter
☞	**STAKE (F5)** to access the Stakeout application program and stake out the calculated COGO point. After staking and storing the COGO point **COGO Brng - Brng Results**, **Result** page is displayed.	34.4
☞	**SHIFT INDIV (F5)** for an individual point ID independent of the ID template. **SHIFT RUN (F5)** changes back to the next ID from the configured ID template.	15.1
7.	**PAGE (F6)** changes to the **Code** page.	
8.	**COGO Brng - Brng Results**, **Code** page **<Code:>/<Point Code:>** The thematical code. All codes of the job can be selected. Type in a code if required.	9 and 7.3.2
9.	**PAGE (F6)** changes to the **Plot** page.	
10.	**COGO Brng - Brng Results**, **Plot** page Arrows point from the known points to the calculated COGO point.	30.6
☞	**SHIFT QUIT (F6)** does not store the COGO point and exits COGO calculation.	
11.	**STORE (F1)** to store the result and return to **COGO Intersection Input**, **Input** page.	
☞	For **<Write Logfile: Yes>** in **COGO Configuration**, **Logfile** page the result is written to the logfile.	

Step	Description	Refer to chapter
12.	Are more COGO intersection calculations to be made? • If **yes**, repeat steps 2. to 12. **<Method:>** in **COGO Intersection Input**, **Input** page can be changed. Refer to the relevant chapters for the other COGO intersection calculation methods. • If **no**, continue with step 13.	32.6.2, 32.6.3 or 32.6.4.
13.	**SHIFT QUIT (F6)** to exit COGO calculation.	

32.6.2 Intersection with Bearing - Distance

Description

The COGO intersection calculation bearing - distance calculates the intersection point of a line and a circle. The line is defined by a point and a direction. The circle is defined by the centre point and the radius.

Elements that must be known are

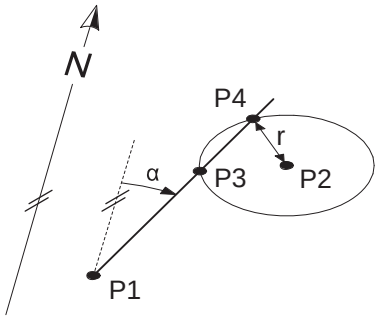
- the coordinates of two points.
- the direction from one known point to the COGO point.
- the distance from the second known point to the COGO point.
- offsets if required and configured.

The coordinates of the known points

- may be taken from the active job.
- may be measured during the COGO calculation.
- may be entered.

Points with full coordinate triplets and position only points can be used.

Diagram



Known

P1 First known point
P2 Second known point
α Direction from P1 to P3 and P4
r Radius, as defined by the distance from P2 to P4 and P3

Unknown

P3 First COGO point
P4 Second COGO point

COGO intersection calculation with bearing - distance step-by-step

The following table explains the most common settings. Refer to the stated chapter for more information on screens.

Step	Description	Refer to chapter
1.	The procedure of a COGO intersection calculation with bearing - distance is similar to a COGO intersection calculation with bearing - bearing. Follow the steps 1. to 5. in paragraph "COGO intersection calculation with bearing - bearing step-by-step". The differences are: • **<Method: Brng - Dist>** is to be selected in **COGO Intersection Input**, **Input** page. • For the second known point **<HDist-XX:>** is used instead of **<Azimuth:>**. The keys and advice mentioned are still valid.	32.6.1
2.	**CALC (F1)** to calculate the COGO points.	

Step	Description	Refer to chapter
☞	Two results are calculated.	
3.	**COGO Brng - Dist Results**, **Result1** page **<Point ID:>** The identifier for the first result of the COGO point depending on the point ID template configured for **<Survey Pts:>** in **CONFIGURE ID Templates**. The point ID can be changed. The calculated coordinates are displayed. Type in a point ID.	15.1
☞	**STAKE (F5)** to access the Stakeout application program and stake out the calculated COGO point. After staking and storing the COGO point **COGO Brng - Brng Results**, **Result1** page is displayed.	34.4
☞	**SHIFT INDIV (F5)** for an individual point ID independent of the ID template. **SHIFT RUN (F5)** changes back to the next ID from the configured ID template.	15.1
☞	**PAGE (F6)** changes to the **Code** page where a code and attributes can be selected.	9
☞	Pressing **PAGE (F6)** twice changes to the **Plot** page. Both COGO points and known points are displayed.	30.6
☞	**SHIFT QUIT (F6)** does not store the COGO points and exits COGO calculations.	
☞	**RSLT1 (F3)** or **RSLT2 (F3)** to view the first and second result.	

Step	Description	Refer to chapter
4.	**COGO Brng - Dist Results**, **Result1** page s the first result to be stored? • If **yes**, **STORE (F1)** to store the result and activate the **Result2** page. For **<Write Logfile: Yes>** in **COGO Configuration**, **Logfile** page the result is written to the logfile. • If **no**, **RSLT2 (F3)** to activate the **Result2** page.	
5.	**COGO Brng - Dist Results**, **Result2** page Repeat step 3.	
6.	**COGO Brng - Dist Results**, **Result2** page Is the second result to be stored? • If **yes**, **STORE (F1)** to store the result and return to **COGO Intersection Input**, **Input** page. For **<Write Logfile: Yes>** in **COGO Configuration**, **Logfile** page the result is written to the logfile. • If **no**, **ESC** does not store the COGO point and returns to **COGO Intersection Input**, **Input** page.	
7.	Are more COGO intersection calculations to be done? • If **yes**, repeat steps 1. to 7. **<Method:>** in **COGO Intersection Input**, **Input** page can be changed. Refer to the relevant chapters for other COGO intersection calculation method than **<Method: Brng - Dist>**. • If **no**, continue with step 8.	32.6.1, 32.6.3 or 32.6.4

Step	Description	Refer to chapter
8.	**SHIFT QUIT (F6)** exit COGO calculation.	

32.6.3 Intersection with Distance - Distance

Description

The COGO intersection calculation distance - distance calculates the intersection point of two circles. The circles are defined by the known point as the centre point and the distance from the known point to the COGO point as the radius.

Elements that must be known are

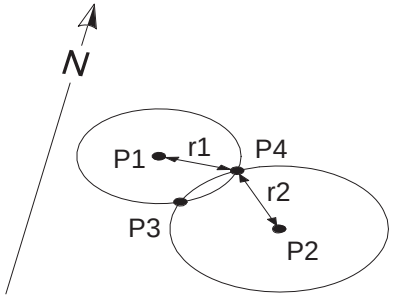
- the coordinates of two points.
- the distance from the known points to the COGO point.

The coordinates of the known points

- may be taken from the active job.
- may be manually occupied during the COGO calculation.
- may be entered.

Points with full coordinate triplets and position only points can be used.

Diagram



Known

P1 First known point
P2 Second known point
r1 Radius, as defined by the distance from P1 to P3 or P4
r2 Radius, as defined by the distance from P2 to P3 or P4

Unknown

P3 First COGO point
P4 Second COGO point

COGO intersection calculation with distance - distance step-by-step

The following table explains the most common settings. Refer to the stated chapter for more information on screens.

Step	Description	Refer to chapter
1.	The procedure for a COGO intersection calculation with distance - distance is very similar to a COGO intersection calculation with bearing - bearing. Follow the steps 1. to 5. in paragraph "COGO intersection calculation with bearing - bearing step-by-step". The differences are: • **<Method: Dist - Dist>** is to be selected in **COGO Intersection Input**, **Input** page. • For both known points **<HDist-XX:>** is used instead of **<Azimuth:>**. The keys mentioned are still valid. • **<Offset:>** is unavailable.	32.6.1
2.	The remaining procedure is identical to a COGO intersection calculation with bearing - distance. The screen is called **COGO Dist - Dist Results**. Follow the steps 2. to 8. in paragraph "COGO intersection calculation with bearing - distance step-by-step".	32.6.2

32.6.4 Intersection with By Points

Description

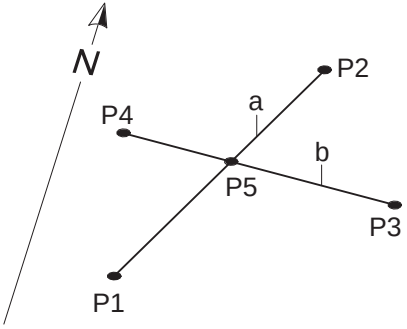
The COGO intersection calculation by points calculates the intersection point of two lines. A line is defined by two points.

Elements that must be known are
- the coordinates of four points.
- offsets of the lines if required and configured.

The coordinates of the known points
- may be taken from the active job.
- may be measured during the COGO calculation.
- may be entered.

Points with full coordinate triplets and position only points can be used.

Diagram



Known

P1	First known point
P2	Second known point
P3	Third known point
P4	Fourth known point
a	Line from P1 to P2
b	Line from P3 to P4

Unknown

P5	COGO point

COGO intersection calculation with by points step-by-step

The following table explains the most common settings. Refer to the stated chapter for more information on screens.

Step	Description	Refer to chapter
1.	Refer to "32.2 Accessing COGO" to access **COGO Intersection Input**.	
☞	**COGO Intersection Input**, **Input** page **SHIFT CONF (F2)** to configure the COGO application program.	32.3.
2.	**COGO Intersection Input**, **Input** page **<Method: By Points>** **<1st Point:>** The point ID of the known start point of the first line for the COGO calculation. **<2nd Point:>** The point ID of the known end point of the first line for the COGO calculation. Select the points stored in the job.	
☞	**SURVY (F5)** when **<1st Point:>** or **<2nd Point:>** is highlighted. To measure a known point for the COGO calculation.	35.2
☞	For all point fields, the MapView interactive display on the **Map** page can be used to select the desired point.	30.5
☞	To type in coordinates for a known point open the choicelist when **<1st Point:>** or **<2nd Point:>** is highlighted. Press **NEW (F2)** to create a new point.	7.3.2
3.	**COGO Intersection Input**, **Input** page	

Step	Description	Refer to chapter
	<Offset:> Available for **<Use Offsets: Yes>** in **COGO Configuration**, **Parameters** page. The offset of the line in the direction **<1st Point:>** to **<2nd Point:>**. A positive offset is to the right, a negative offset is to the left. Type in the offset if required.	
☞	The value for the offset can be calculated from two existing points. **INV (F2)** when **<Offset:>** is highlighted. To perform a COGO inverse calculation. ☞ Upon pressing **STORE (F1)** in **COGO Inverse**, the result from the COGO inverse calculation is copied to the field which was highlighted when **INV (F2)** was pressed. ☞ For **<Write Logfile: Yes>** in **COGO Configuration**, **Logfile** page the result of the COGO inverse calculation is written to the logfile.	32.4
☞	The value for the offset can be selected from previous COGO inverse calculations. **LAST (F4)** when **<Offset:>** is highlighted. To recall previous results from COGO inverse calculations. Upon pressing **CONT (F1)** in **COGO Last Inverse Calculations**, the selected result is copied to the field.	32.12
☞	The value for the offset can be mathematically modified. **SHIFT MODIF (F4)** when **<Offset:>** is highlighted. To add, subtract, multiply and divide values.	32.13

Step	Description	Refer to chapter
4.	**COGO Intersection Input**, **Input** page The procedure for the third and fourth known point and the offset is identical to the procedure for the first and second known point. Repeat steps 2. and 3.	
5.	The remaining procedure is identical to a COGO intersection calculation with bearing - bearing. The screen is called **COGO By Points Results**. On the **Plot** page two solid lines are displayed. Follow the steps 5. to 13. in paragraph "COGO intersection calculation with bearing - bearing step-by-step".	32.6.1

32.6.5 Intersection with TPS Observation - TPS Observation

Description

The COGO intersection calculation TPS observation - TPS observation calculates the intersection point of two lines. A line is defined by a TPS station and a TPS measurement from this station.

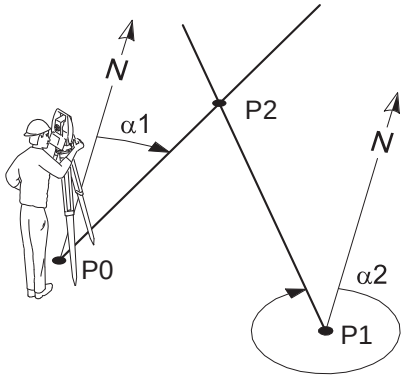
Elements that must be known are
- the coordinates of two points.
- azimuths of the lines.

The coordinates of the known points
- must be taken from the active job.
- must be TPS station points.

The azimuths of the lines
- must be TPS measurements angle measurements from the known points.
- can be two angle measurements or an angle measurement and a distance measurement.

Points with full coordinate triplets and position only points can be used.

Diagram



Known
P0 First known point (TPS station)
P1 Second known point (TPS station)
α1 Direction from P0 to P2
α2 Direction from P1 to P2
Unknown
P2 COGO point

COGO intersection calculation with TPS Obs - TPS Obs step-by-step

The following table explains the most common settings. Refer to the stated chapter for more information on screens.

Step	Description	Refer to chapter
1.	Refer to "32.2 Accessing COGO" to access **COGO Intersection Input**.	
☞	**COGO Intersection Input**, **Input** page **SHIFT CONF (F2)** to configure the COGO application program.	32.3
2.	**COGO Intersection Input**, **Input** page <Method: TPS Obs-TPS Obs> **<1st TPS Stn:>** The point ID of the first TPS station which is the known start point of the first line for the COGO calculation.	

Step	Description	Refer to chapter
	<TPS Measmnt:> The point ID of the TPS measurement which is the known end point of the first line for the COGO calculation. **<Azimuth:>** The azimuth related to the known end point of the first line for the COGO calculation. **<2nd TPS Stn:>** The point ID of the second TPS station which is the known start point of the second line for the COGO calculation. **<TPS Measmnt:>** The point ID of the TPS measurement which is the known end point of the second line for the COGO calculation. **<Azimuth:>** The azimuth related to the known end point of the second line for the COGO calculation. Points can only be selected from the active job. Points for the **<2nd TPS Stn:>** and the **<TPS Measmnt:>** from that station can also be directly measured when using this method.	
☞	The value for the azimuth can be calculated from two existing points. **INV (F2)** when **<Azimuth:>** is highlighted. To perform a COGO inverse calculation. ☞ Upon pressing **STORE (F1)** in **COGO Inverse**, the result from the COGO inverse calculation is copied to the field which was highlighted when **INV (F2)** was pressed. ☞ For **<Write Logfile: Yes>** in **COGO Configuration**, **Logfile** page the result of the COGO inverse calculation is written to the logfile.	32.4

Step	Description	Refer to chapter
☞	The value for the azimuth can be selected from previous COGO inverse calculations. **LAST (F4)** when **<Azimuth:>** is highlighted. To recall previous results from COGO inverse calculations. Upon pressing **CONT (F1)** in **COGO Last Inverse Calculations**, the selected result is copied to the field.	32.12

32.7 COGO Calculation - Line Calculations Method

32.7.1 Line Calculation - Base Point

Description

The COGO line calculation base point calculates the base point, station and offset of a point in relation to a line.

Elements that must be known are

- coordinates of two points and an offset point.

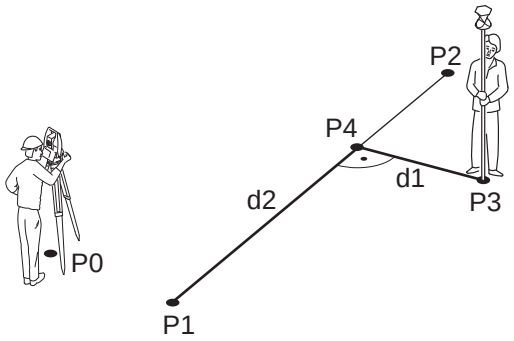
OR

- coordinates of one point and an offset point
- bearing and distance from one point

The coordinates of the known points

- may be taken from the active job.
- may be measured during the COGO calculation.
- may be entered.

Diagram



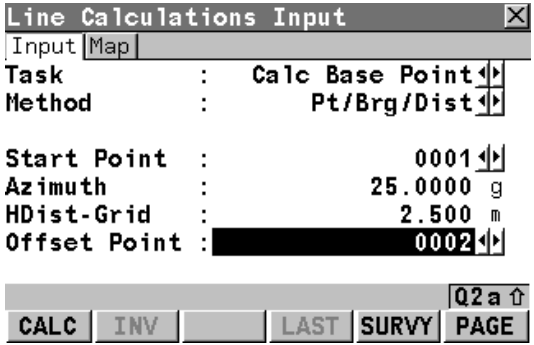
P0 Instrument station
P1 **<Start Point:>**
P2 **<End Point:>**
P3 **<Offset Point:>**
P4 Base point
d1 **<Offset-XX:>**
d2 **<ΔLine-XX:>**

Line management is not available for COGO line calculations.

Access

Refer to "32.2 Accessing COGO" to access **COGO Line Calculations Input**.

COGO
Line Calculations Input, Input page



CALC (F1)
To calculate COGO point.

INV (F2)
To calculate the values for the distance and the offset from two existing points. Available if **<Azimuth:>** or **<HDist-XX:>** is highlighted.

LAST (F4)
To select the values for the distance and the offset from previous COGO inverse calculations. Available if **<Azimuth:>** or **<HDist-XX:>** is highlighted.

SURVY (F5)
To measure a point for the COGO calculation. Available if **<Start Point:>** or **<End Point:>** is highlighted.

SHIFT CONF (F2)
To configure the COGO application program.

SHIFT MODIF (F4)
To mathematically modify the values. Available if **<Azimuth:>**, **<ΔLine-XX:>** or **<HDist-XX:>** is highlighted.

Description of fields

Field	Option	Description
<Task:>	**Calc Base Point**	Calculates the base point, the station and offset of a point in relation to a line.
	Calc Offset Point	Calculates the coordinates of a new point after input of station and offset values in relation to a line.
	Segmentation	Calculates the coordinates of new points on a line either equally spaced or with defined segments.
<Method:>		The method by which the line will be defined.
	2 Points	Uses two known points to define the line.
	Pt/Brg/Dist	Defines the line using a known point, a distance and an azimuth of the line.
<Start Point:>	Choicelist	The start point of the line. All points from **COGO Data: Job Name** can be selected.

Field	Option	Description
<End Point:>	Choicelist	Available for **<Method: 2 Points>**. The end point of the line. All points from **COGO Data: Job Name** can be selected.
<Azimuth:>	User input	Available for **<Method: Pt/Brg/Dist>**. The azimuth of the line.
<HDist-XX:>	User input	Available for **<Method: Pt/Brg/Dist>**. The horizontal distance from the start point to the end point of the line.
<ΔLine-XX:>	User input	Available for **<Task: Calc Offset Point>**. Horizontal distance from start point to base point.
<Offset Point:>	Choicelist	Available for **<Task: Calc Offset Point>**. The offset point.
<Offset-XX:>	User input	Available for **<Task: Calc Offset Point>**. Offset from base point to offset point. Positive to the right and negative to the left of the line.

Next step
PAGE (F6) accesses **Map** page. Refer to paragraph "COGO Line Calculations Input, Map page".

COGO Line Calculations Input, Map page

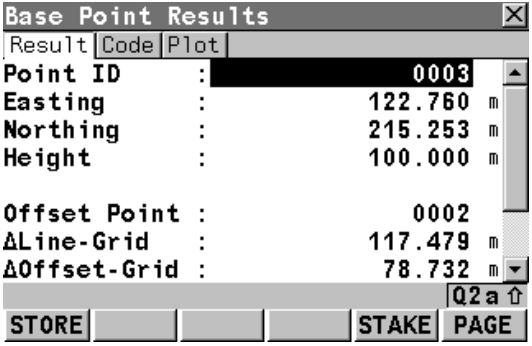
The **Map** page provides an interactive display of the data. Refer to "30 MapView Interactive Display Feature" for information on the functionality and softkeys available.

Next step

IF	THEN
<Task: Calc Base Point>	**CALC (F1)** accesses **COGO Base Point Results**. Refer to paragraph "COGO XX Point Results, Result page".
<Task: Calc Offset Point>	**CALC (F1)** accesses **COGO Offset Point Results**. Refer to paragrahp "COGO XX Point Results, Result page".
<Task: Segmentation>	**CALC (F1)** accesses **COGO Define Segmentation**. Refer to paragraph "32.7.3 Line Calculation - Segmentation".

COGO XX Point Results, Result page

The result screens for base point and offset point are very similar. The explanations given for the softkeys below are valid for the **Result** page.



STORE (F1)
To store result and to return to **COGO Line Calculations Input**.

STAKE (F5)
To access the Stakeout application program and stake out the calculated COGO point.

PAGE (F6)
To change to another page on this screen.

SHIFT INDIV (F5) and **SHIFT RUN (F5)**
To change between entering an individual point ID different to the defined ID template and the running point ID according to the ID template. Refer to "15.1 ID Templates".

Description of fields

Field	Option	Description
<Point ID:>	User input	The identifier for the COGO point depending on the point ID template configured for **<Survey Pts:>** in **CONFIGURE ID Templates**.
<Offset Point:>	Output	Point ID of offset point. Available for **<Task: Calc Base Point>**.
<ΔLine-XX:>	Output	Horizontal distance from start point to base point. Available for **<Task: Calc Base Point>**.
<ΔOffset-XX:>	Output	Offset from base point to offset point. Positive to the right and negative to the left of the line. Available for **<Task: Calc Base Point>**.
<Line Length:>	Output	Length of line from start point to end point.
<Line Brng:>	Output	Bearing of line from start point to end point.
<Offs Pt Brng:>	Output	Bearing of offset point from base point to offset point.

Next step
PAGE (F6) changes to the **Code** page.

COGO
XX Point Results, Code page

The functionality of the **Code** page is similar to **COGO Traverse Result, Code** page.

Next step
PAGE (F6) changes to the **Plot** page.

COGO
XX Point Results, Plot page

The functionality of the **Plot** page is similar to **COGO Traverse Results, Plot** page.

Next step

STORE (F1) stores the result and accesses **COGO Line Calculations Input, Input** page.

32.7.2 Line Calculation - Offset Point

Description

The COGO line calculation offset point calculates the coordinates of a new point after input of station and offset values in relation to a line.

Elements that must be known are
- coordinates of two points.
- offsets.

OR
- coordinates of one point.
- bearing and distance from one point.
- offsets.

The coordinates of the known points
- may be taken from the active job.
- may be measured during the COGO calculation.
- may be entered.

Line management is not available for COGO line calculations.

COGO line calculation offset point step-by-step

The following table explains the most common settings. Refer to the stated chapter for more information on screens.

Step	Description	Refer to chapter
1.	Refer to "32.2 Accessing COGO" to access **COGO Line Calculations Input**.	
☞	**COGO Line Calculations Input, Input** page. **SHIFT CONF (F2)** to configure the COGO application program.	 32.3
2.	**COGO Line Calculations Input, Input** page. **<Task: Calc Offset Point>**	32.7.1
3.	**CALC (F1)** calculates the results.	
4.	**COGO Offset Point Results, Result** page **STORE (F1)** stores the results.	32.7.1

32.7.3 Line Calculation - Segmentation

Description

The COGO line calculation segmentation calculates the coordinates of new points on a line.

Elements that must be known are

- coordinates of the start and the end point of the line

OR

- a bearing and distance from a known point that define the line

AND EITHER

- the number of segments dividing the line

OR

- a segment length for the line.

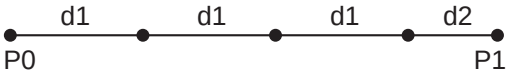
The coordinates of the known points

- may be taken from the active job.
- may be measured during the COGO calculation.
- may be entered.

Diagram

Line divided by **<Method: No. of Segments>**

P0 **<Start Point:>**
P1 **<End Point:>**
d Equally spaced segments result from dividing a line by a certain number of points.



Line divided by **<Method: Segment Length>**

P0 **<Start Point:>**
P1 **<End Point:>**
d1 **<Seg Length:>**
d2 Remaining segment

COGO line calculation segmentation step-by-step

The following table explains the most common settings. Refer to the stated chapter for more information on screens.

Step	Description	Refer to chapter
1.	Refer to "32.2 Accessing COGO" to access **COGO Line Calculation Input**.	
☞	**COGO Line Calculation Input**, **Input** page **SHIFT CONF (F2)** to configure the COGO application program.	32.3
2.	**COGO Line Calculations Input**, **Input** page **<Task: Segmentation>**	32.7.1
3.	**CALC (F1)** to access **COGO Define Segmentation**.	
4.	**COGO Define Segmentation** **<Method:>** How the line is to be divided. Refer to paragraph "Diagram". Depending on the selection, the following fields are user input or output fields. **<Line Length:>** Calculated line length between the selected **<Start Point:>** and **<End Point:>**.	

Step	Description	Refer to chapter
	<No. of Segs:> For **<Method: No. of Segments>** type in the number of segments for the line. For **<Method: Segment Length>** type in the segment length for the line. A remaining segment may result from this method. **<Seg Length:>** For **<Method: No. of Segments>** this is the calculated length of each segment. For **<Method: Segment Length>** type in the required segment length. **<Last Seg Lgth:>** Available for **<Method: Segment Length>**. The length of the remaining segment. **<Start PtID:>** The point ID to be assigned to the first new point on the line. The selected point ID templates from **CONFIGURE ID Templates** are not applied. **<PtID Inc:> <Start PtID:>** is incremented numerically for the second, third, etc. point on the line.	
5.	**CALC (F1)** to access **COGO Segmentation Results**.	
☞	The coordinates of the new points are calculated. The heights are computed along the line assuming a linear slope between **<Start Point:>** and **<End Point:>**.	
6.	**COGO Segmentation Results**, **Result** page **<Number of Segments:>** Describes the number of resulting segments for the line including the remaining segment, if it applies.	

Step	Description	Refer to chapter
	<Last Segment Lgth:> Available for **<Method: Segment Length>**. The length of the remaining segment.	
☞	**STAKE (F5)** to access the Stakeout application program and stake out the calculated COGO point. **SHIFT QUIT (F6)** or **ESC** return to **COGO Segmentation Results**, **Result** page.	
7.	**PAGE (F1)** to access **COGO Segmentation Results**, **Plot** page The known points defining the line and those created on the line are shown in black.	30.6
8.	**CONT (F1)** returns to **COGO Line Calculations Input**.	

32.8 COGO Calculation - Arc Calculations Method

32.8.1 Arc Calculation - Arc Centre

Description

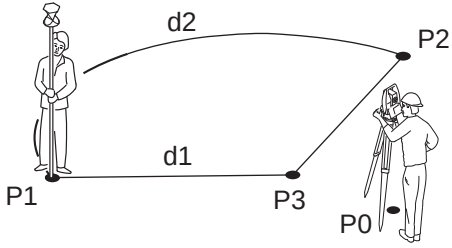
The COGO arc calculation arc centre calculates the coordinates of the centre of the arc.

Elements that must be known are
- coordinates of three points

OR
- coordinates of two points
- radius to the two points

The coordinates of the known points
- may be taken from the active job.
- may be measured during the COGO calculation.
- may be entered.

Diagram



P0	Instrument station
P1	**<Start Point:>**
P2	**<End Point:>**
P3	Arc Centre
d1	**<Arc Radius:>**
d2	**<Arc Length:>**

Arc management is not available for COGO arc calculations.

Access

Refer to "32.2 Accessing COGO" to access **COGO Arc Calculations Input**.

COGO
Arc Calculations Input
Input page

The softkeys are similar to line calculation. Refer to "32.7.1 Line Calculation - Base Point" for information on softkeys.

Description of fields

Field	Option	Description
<Task:>	**Calc Arc Center**	Calculates the coordinates of the centre of the arc.
	Calc Offset Point	Calculates the coordinates of a new point after input of station and offset values in relation to an arc.
	Calc Base Point	Calculates the base point, the station and offset of a point in relation to an arc.
	Segmentation	Calculates the coordinates of new points on an arc either equally spaced, in a defined interval or in a defined angle.
<Method:>		The method by which the arc will be defined.
	3 Points	Uses three known points to define the arc.
	2 Points/Radius	Defines the arc using two known points and a radius of the arc.
	2 Tgnts/Radius	Defines the arc using two tangents and a radius of the arc.

Field	Option	Description
	2 Tgnts/Chrd Lngt	Defines the arc using two tangents and the chord of the arc.
<Start Point:>	Choicelist	The start point of the arc. All points from **COGO Data: Job Name** can be selected. Available for **<Method: 3 Points>** and **<Method: 2 Points/Radius>**.
<Second Point:>	Choicelist	All points from **COGO Data: Job Name** can be selected. Available for **<Method: 3 Points>**. The second point of the arc.
<End Point:>	Choicelist	The end point of the arc. All points from **COGO Data: Job Name** can be selected. Available for **<Method: 3 Points>** and **<Method: 2 Points/Radius>**.
<Point 1:>	Choicelist	A point on the first tangent. Available for **<Method: 2 Tgnts/Radius>**, **<Method: 2 Tgnts/Arc Lngt>** and **<Method: 2 Tgnts/Chrd Lngt>**.
<PI Point:>	Choicelist	The point of intersection of the two tangents. Available for **<Method: 2 Tgnts/Radius>**, **<Method: 2 Tgnts/Arc Lngt>** and **<Method: 2 Tgnts/Chrd Lngt>**.
<Point 2:>	Choicelist	A point on the second tangent. Available for **<Method: 2 Tgnts/Radius>**, **<Method: 2 Tgnts/Arc Lngt>** and **<Method: 2 Tgnts/Chrd Lngt>**.
<Radius:>	User input	The radius of the arc. Available for **<Method: 2 Points/Radius>** and **<Method: 2 Tgnts/Radius>**.
<Arc Length:>	User input	The length of the arc. Available for **<Method: 2 Tgnts/Arc Lngt>**.

Field	Option	Description
<Chord Length:>	User input	The length of the chord. Available for **<Method: 2 Tgnts/Chrd Lngt>**.
<ΔArcDist-XX:>	User input	Horizontal distance along the arc from start point to base point. Available for **<Task: Calc Offset Point>**.
<ΔOffset-XX:>	User input	Offset from base point to offset point. Positive to the right and negative to the left of the arc. Available for **<Task: Calc Offset Point>**.
<Offset Point:>	Choicelist	The offset point. Available for **<Task: Calc Base Point>**.

Next step

IF	THEN
<Task: Calc Arc Center>	**CALC (F1)** accesses **COGO Center of Arc Results**. Refer to paragraph "COGO XX Results, Result page".
<Task: Calc Offset Point>	**CALC (F1)** accesses **COGO Offset Point Results**. Refer to paragraph "COGO XX Results, Result page".
<Task: Calc Base Point>	**CALC (F1)** accesses **COGO Base Point Results**. Refer to paragraph "COGO XX Results, Result page".
<Task: Segmentation>	**CALC (F1)** accesses **COGO Define Segmentation**. Refer to "32.8.4 Arc Calculation - Segmentation".

COGO
XX Results,
Result page

Refer to paragraph "32.7.1 Line Calculation - Base Point" for information on softkeys.

Description of fields

Field	Option	Description
<Point ID:>	User input	The identifier for the COGO point depending on the point ID template configured for **<Survey Pts:>** in **CONFIGURE ID Templates**.
<Arc Radius:>	Output	Computed radius of arc.
<Arc Length:>	Output	Computed length of arc.
<Offs Pt Brng:>	Output	Available for **<Task: Calc Offset Point>**. Bearing of offset point from base point to offset point.
<Offset Point:>	Output	Available for **<Task: Calc Base Point>**. Point ID of offset point.
<ΔArcDist-XX:>	Output	Available for **<Task: Calc Base Point>**. Horizontal distance along the arc from start point to base point.
<ΔOffset-XX:>	Output	Available for **<Task: Calc Base Point>**. Offset from base point to offset point. Positive to the right and negative to the left of the line.

Next step
PAGE (F6) changes to the **Code** page.

COGO XX Results, Code page

The functionality of the **Code** page is similar to **COGO Traverse Results, Code** page.

Next step
PAGE (F6) changes to the **Plot** page.

COGO XX Results, Plot page

The functionality of the **Plot** page is similar to **COGO Traverse Results, Plot** page.

Next step
STORE (F1) stores the result and accesses **COGO Arc Calculations Input, Input** page.

32.8.2 Arc Calculation - Base Point

Description

The COGO arc calculation base point calculates the coordinates of the base point, station and offset of a point in relation to an arc.

Elements that must be known are

- coordinates of three points
- coordinates of an offset point

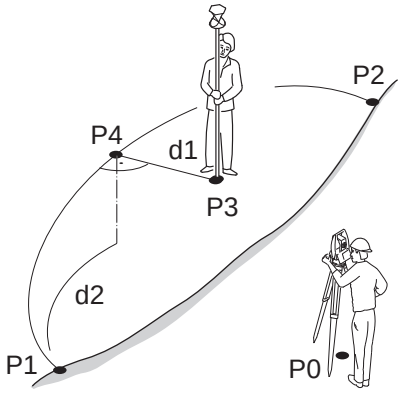
OR

- coordinates of two points
- radius to the two points
- coordinates of an offset point

The coordinates of the known points

- may be taken from the active job.
- may be measured during the COGO calculation.
- may be entered.

Diagram



P0 Instrument station
P1 **<Start Point:>**
P2 **<End Point:>**
P3 **<Offset Point:>**
P4 Base point
d1 **<ΔOffset-XX:>**
d2 **<ΔArcDist-XX:>**

Arc management is not available for COGO arc calculations.

COGO arc calculation base point step-by-step

The following table explains the most common settings. Refer to the stated chapter for more information on screens.

Step	Description	Refer to chapter
1.	Refer to "32.2 Accessing COGO" to access **COGO Arc Calculations Input, Input** page.	
	COGO Arc Calculations Input, Input page. **SHIFT CONF (F2)** to configure the COGO application program.	32.3
2.	**COGO Arc Calculations Input, Input** page. **<Task: Calc Base Point>**	32.8.1
3.	**CALC (F1)** calculates the results.	

Step	Description	Refer to chapter
4.	**COGO Base Point Results, Result** page **STORE (F1)** stores the results.	32.8.1

32.8.3 Arc Calculation - Offset Point

Description

The COGO arc calculation offset point calculates the coordinates of a new point after input of arc and offset values in relation to an arc.

Elements that must be known are
- coordinates of three points.
- offsets.

OR
- coordinates of two points.
- radius to the two points.
- offsets.

The coordinates of the known points
- may be taken from the active job.
- may be measured during the COGO calculation.
- may be entered.

Arc management is not available for COGO arc calculations.

COGO arc calculation offset point step-by-step

The following table explains the most common settings. Refer to the stated chapter for more information on screens.

Step	Description	Refer to chapter
1.	Refer to "32.2 Accessing COGO" to access **COGO Arc Calculations Input**.	

Step	Description	Refer to chapter
☞	**COGO Arc Calculations Input, Input** page. **SHIFT CONF (F2)** to configure the COGO application program.	 32.3
2.	**COGO Arc Calculations Input, Input** page. **<Task: Calc Offset Point>**	32.8.1
3.	**CALC (F1)** calculates the results.	
4.	**COGO Offset Point Results, Result** page **STORE (F1)** stores the results.	32.8.1

32.8.4 Arc Calculation - Segmentation

The COGO arc calculation segmentation and the functionality of all screens and fields are similar to those for COGO line calculation segmentation. Refer to "32.7.3 Line Calculation - Segmentation".

Exceptions to line calculation segmentation

New field and option in COGO Define Segmentation

Field	Option	Description
<Method:>	**Delta Angle**	To divide the arc by an angular value.
<Delta Angle:>	User input	The angular value by which new points will be defined on the arc.

32.9 COGO Calculation - Shift, Rotate & Scale (Manual) Method

Description

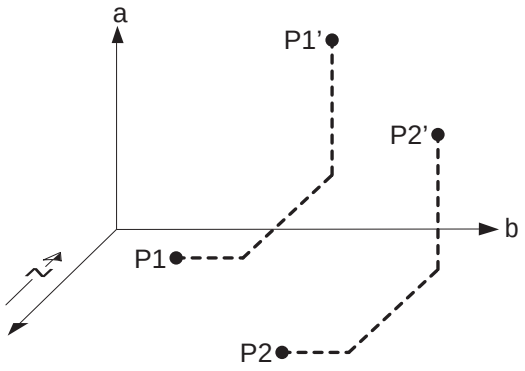
The COGO calculation shift, rotate & scale (manual) applies shifts and/or rotation and/or scale to one or several known points. The values for shifts and/or rotation and/or scale are typed in manually.

Elements that must be known are

- the coordinates of the points to be shifted, rotated and/or scaled. They must be stored in the active job.
- the shift values. They can be defined as the direction of Easting, Northing and Height or as an azimuth and a grid distance or as shift from one point to another.
- the rotation value. It can be defined by a point as rotation centre plus a rotation or by an existing and new azimuth.
- the scale. It is only applied to the position.

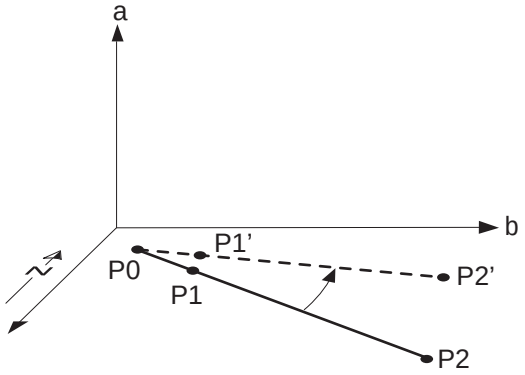
Points with full coordinate triplets, position only points and height only points can be used.

Diagram



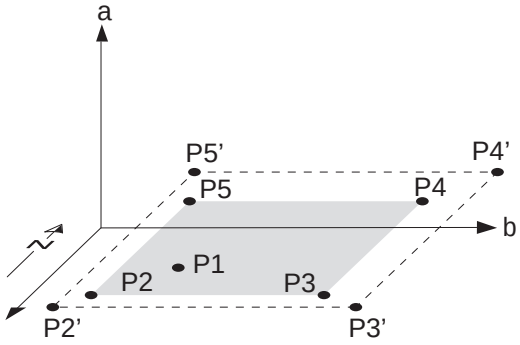
Shift

a Height
b Easting
P1 Known point
P1' Shifted point
P2 Known point
P2' Shifted point



Rotation

a Height
b Easting
P0 **<Rotation Pt:>**
P1 Known point
P1' Rotated point
P2 Known point
P2' Rotated point



Scale

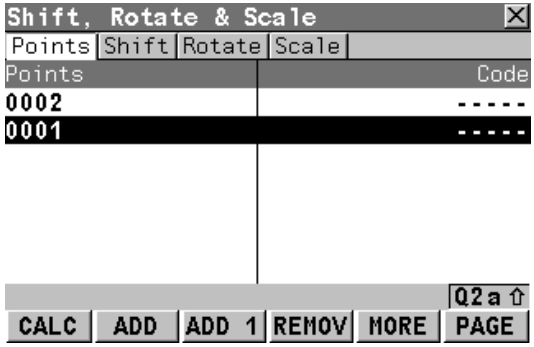
a Height
b Easting
P1 **<Rotation Pt:>**, can be held fixed, all other points are then scaled from here
P2 Known point
P2' Scaled point
P3 Known point
P3' Scaled point
P4 Known point
P4' Scaled point
P5 Known point
P5' Scaled point

Access

Refer to "32.2 Accessing COGO" to access **COGO Shift, Rotate & Scale**.

COGO Shift, Rotate & Scale, Points page

Listed are points which have been selected for shifting, rotating and/or scaling.



CALC (F1)
To perform the shift, rotation and scale calculation and to continue with the subsequent screen. Calculated COGO points are not yet stored.

ADD (F2)
To add several points from the active job to the list. Accesses **COGO Data: Job Name**. Selected sort and filter settings apply. **CONT (F1)** adds all displayed points to the list in **COGO Shift, Rotate & Scale** and returns to that screen.

ADD 1 (F3)

To add one point from the active job to the list. Accesses **COGO Data: Job Name**. Selected sort and filter settings apply. **CONT (F1)** adds the currently highlighted point to the list in **COGO Shift, Rotate & Scale** and returns to that screen.

REMOV (F4)

To remove the highlighted point from the list. The point itself is not deleted.

MORE (F5)

To display information about the codes if stored with any point, the time and the date of when the point was stored and the 3D coordinate quality and the class.

PAGE (F6)

To change to another page on this screen.

SHIFT REM A (F4)

To remove all points from the list. The points itself are not deleted.

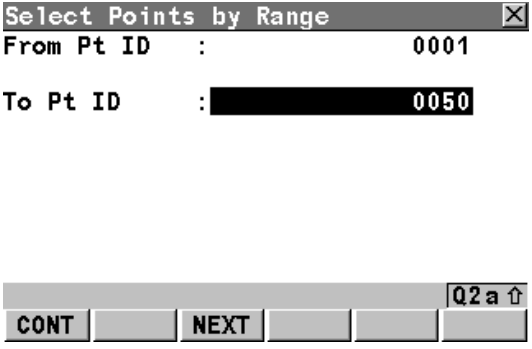
SHIFT RANGE (F5)

To define a range of points from the active job to be added to the list. Refer to paragraph "COGO Select Points by Range".

Next step

IF	THEN
all points from **COGO Data: Job Name** are to be added	**ADD (F2)**.
one point from **COGO Data: Job Name** is to be added	**ADD 1 (F3)**.
a range of points from **COGO Data: Job Name** is to be added	**SHIFT RANGE (F5)** accesses **COGO Select Points by Range**. Refer to paragraph "COGO Select Points by Range".
all points are added	**PAGE (F1)** accesses **COGO Shift, Rotate & Scale**, **Shift** page. Refer to paragraph "COGO Shift, Rotate & Scale, Shift page".

COGO
Select Points by Range



CONT (F1)
To add the points within the selected range to the list in **COGO Shift, Rotate & Scale**, **Points** page and to return to the screen from where this screen was accessed.

NEXT (F3)
To add the points within the selected range to the list in **COGO Shift, Rotate & Scale**, **Points** page without quitting this screen. Another range of point ID's can be selected.

Description of fields

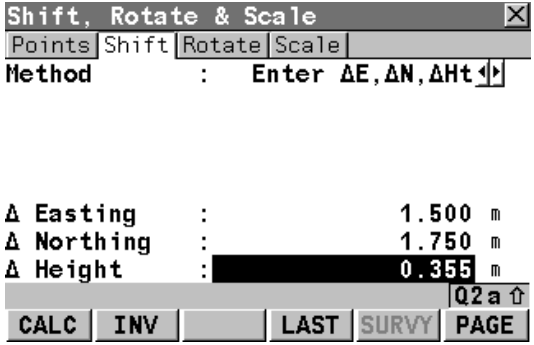
Field	Option	Description
<From Pt ID:> and **<To Pt ID:>**	User input	• Numeric point ID's in both fields: Points with numeric point ID's falling within the range are selected. Example: **<From Pt ID: 1>**, **<To Pt ID: 50>** Selected are point ID's 1, 2, 3, 4, 5, 6, 7, 8, 9, 10…. 49, 50 as well as 001, 01, 0000045, ... Not selected are point ID's 100,200,300, ... • Alphanumeric point ID's in both fields: The left most character of both entries is used as the basis for the range. The standard ASCII numerical range is used. Points with alphanumeric point ID's falling within the range are selected. Example: **<From Pt ID: a9>**, **<To Pt ID: c200>** Selected are point ID's a, b, c, aa, bb, cc, a1, b2, c3, c4, c5, a610, ... Not selected are point ID's d100, e, 200, 300, tzz ...

Next step

Step	Description
1.	**CONT (F1)** adds all points within the range to the list in **COGO Shift, Rotate & Scale** and returns to the screen from where this screen was accessed.

Step	Description
2.	**PAGE (F6)** accesses **COGO Shift, Rotate & Scale**, **Shift** page. Refer to "COGO Shift, Rotate & Scale, Shift page".

COGO
Shift, Rotate & Scale, Shift page



CALC (F1)
To perform the shift, rotation and scale calculation and to continue with the subsequent screen. Calculated COGO points are not yet stored.

INV (F2)
To calculate the amout of shift in Easting, Northing and height from two existing points. Available if **<Δ Easting:>**, **<Δ Northing:>** or **<Δ Height:>** is highlighted.

LAST (F4)
To select the value for the shift from previous COGO inverse calculations. Available if **<Δ Easting:>**, **<Δ Northing:>** or **<Δ Height:>** is highlighted.

SURVY (F5)
To measure a point for the COGO calculation. Available for **<Method: Use 2 Points>** if **<From:>** or **<To:>** is highlighted.

PAGE (F6)
To change to another page on this screen.

SHIFT CONF (F2)
To configure the COGO application program. Accesses **COGO Configuration**. Refer to "32.3 Configuring COGO".

SHIFT MODIF (F4)
To mathematically modify the values. Available if **<Δ Easting:>**, **<Δ Northing:>** or **<Δ Height:>** is highlighted.

Description of fields

Field	Option	Description
<Method:>		The method by which the shift in Δ Easting, Δ Northing and Δ Height will be determined.
	Enter ΔE,ΔN,ΔHt	Defines the shift using coordinate differences.
	Enter Bng,Dst,Ht	Defines the shift using an azimuth, a distance and a height difference.
	Use 2 Points	Computes the shift from the coordinate differences between two known points.
<From:>	Choicelist	Available for **<Method: Use 2 Points>**. The point ID of the first known point for calculating the shift.
<To:>	Choicelist	Available for **<Method: Use 2 Points>**. The point ID of the second known point for calculating the shift.
<Azimuth:>	User input	Available for **<Method: Enter Bng,Dst,Ht>**. The azimuth defines the direction of the shift.
<HDist-XX:>	User input	Available for **<Method: Enter Bng,Dst,Ht>**. The amount of shift from the original point to the calculated COGO points.

Field	Option	Description
<Δ Easting:>	User input or output	The amount of shift in East direction.
<Δ Northing:>	User input or output	The amount of shift in North direction.
<Δ Height:>	User input or output	The amount of shift in height.

Next step

PAGE (F6) accesses **COGO Shift, Rotate & Scale**, **Rotate** page. Refer to "COGO Shift, Rotate & Scale, Rotate page".

COGO Shift, Rotate & Scale, Rotate page

The softkeys are the same as on the Shift page. Refer to paragraph "COGO Shift, Rotate & Scale, Shift page" for information on the keys.

Description of fields

Field	Option	Description
<Method:>		The method by which the rotation angle will be determined.
	User Entered	The rotation can be manually typed in.
	Computed	The rotation will be calculated as **<New Azimuth:>** minus **<Existing Az:>**.
<Rotation Pt:>	Choicelist	The point around which all points will be rotated.

Field	Option	Description
<Existing Az:>	User input	Available for **<Method: Computed>**. A known direction before rotating.
<New Azimuth:>	User input	Available for **<Method: Computed>**. A known direction after rotating.
<Rotation:>	User input or output	The amount by which the points will be rotated.

Next step

PAGE (F6) accesses **COGO Shift, Rotate & Scale**, **Scale** page. Refer to "COGO Shift, Rotate & Scale, Scale page".

COGO Shift, Rotate & Scale, Scale page

The softkeys are the same as on the Shift page. Refer to paragraph "COGO Shift, Rotate & Scale, Shift page" for information on the keys.

Description of fields

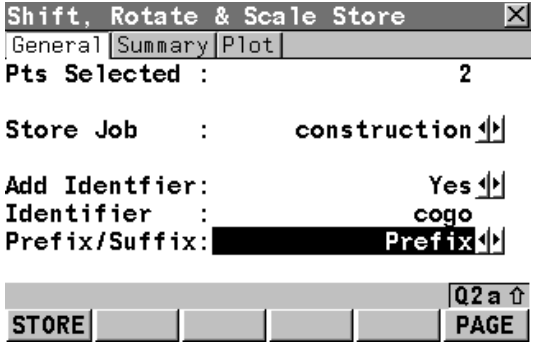
Field	Option	Description
<Method:>		The method by which the scale factor will be determined.
	User Entered	The scale factor can be manually typed in.
	Computed	The scale factor will be calculated as **<New Dist:>** divided by **<Existing Dist:>**.

Field	Option	Description
<Existing Dist:>	User input	Available for **<Method: Computed>**. A known distance before scaling. This value is used for calculating the scale factor.
<New Dist:>	User input	Available for **<Method: Computed>**. A known distance after scaling. This value is used for calculating the scale factor.
<Scale:>	User input or output	The scale factor used in the calculation.
<Scale From Pt:>	**No** **Yes**	Scaling is performed by multiplying the original coordinates of all points by **<Scale:>**. **<Scale:>** is applied to the coordinate difference of all points relative to **<Rotation Pt:>** selected on the **Rotation** page. The coordinates of **<Rotation Pt:>** will not change.

Next step

CALC (F1) performs the shift, rotation and scale calculation and accesses **COGO Shift, Rotate & Scale Store**.

COGO
Shift, Rotate & Scale Store,
General page



STORE (F1)
To to store the results and continue with the next subsequent screen.

PAGE (F6)
To change to another page on this screen.

Description of fields

Field	Option	Description
<Pts Selected:>	Output	The number of selected points having been shifted, rotated and/or scaled.
<Store Job:>	Choicelist	The calculated COGO points will be stored in this job. All jobs from **Main Menu: Manage...\Jobs** can be selected. The original points are not copied to this job.
<Add Identifier:>	**Yes** or **No**	Activates the use of additional identifiers for the point ID's of the calculated COGO points.
<Identifier:>	User input	The identifier with up to four characters is added in front of or at the end of the ID of the calculated COGO points.

Field	Option	Description
<Prefix/Suffix:>	**Prefix**	Adds the setting for **<Identifier:>** in front of the original point ID's.
	Suffix	Adds the setting for **<Identifier:>** at the end of the original point ID's.

Next step

IF	THEN
the used parameters are to be viewed	**PAGE (F6)** accesses **COGO Shift, Rotate & Scale Store**, **Summary** page.
the calculated COGO points are to be viewed graphically	**PAGE (F6)** accesses **COGO Shift, Rotate & Scale Store**, **Plot** page. Original points are displayed in grey, calculated COGO points are displayed in black.
the calculated COGO points are to be stored	**STORE (F1)** accesses **COGO Shift, Rotate & Scale Results**, **Result** page. Refer to paragraph "COGO Shift, Rotate & Scale Results Result page".

COGO
Shift, Rotate & Scale
Results
Result page

Description of fields

Field	Option	Description
<No. of New Pts:>	Output	Number of new points created.
<No. of Skipped Pts>	Output	Number of points which were skipped either due to not being able to convert coordinates or points with identical point ID's already existed in **<Store Job:>**.

Next step

IF	THEN
the stored COGO points are to be viewed graphically	**PAGE (F6)** accesses **COGO Shift, Rotate & Scale Results**, **Plot** page. Original points are displayed in grey, calculated COGO points are displayed in black.
more points are to be shifted, rotated and/or scaled	**CONT (F1)** returns to **COGO Shift, Rotate & Scale**.
COGO is to be ended	**SHIFT QUIT (F6)**.

32.10 COGO Calculation - Shift, Rotate & Scale (Match Pts) Method

Description

The COGO calculation shift, rotate & scale (match pts) applies shifts and/or rotation and/or scale to one or several known points. The shifts and/or rotation and/or scale are calculated from selected points using a 2D Helmert tranformation.

Elements that must be known are

- the coordinates of at least two matching points for the calculation of the shifts and/or rotation and/or scale.
- the coordinates of the points to be shifted, rotated and/or scaled. They must be stored in the active job.
- the shift values. They can be defined as the direction of Easting, Northing and Height or as an azimuth and a grid distance or as shift from one point to another.
- the rotation value. It can be defined by a point as rotation centre plus a rotation or by an existing and new azimuth.
- the scale. It is only applied to the position.

Points with full coordinate triplets, position only points and height only points can be used.

Computation of shift, rotation and scale values

The number of pairs of points matched determines whether the shift, rotation and scale values are computed.

Number of pairs of points matched	Shift East	Shift North	Shift Height	Rotation	Scale
1	x	x	x	-	-

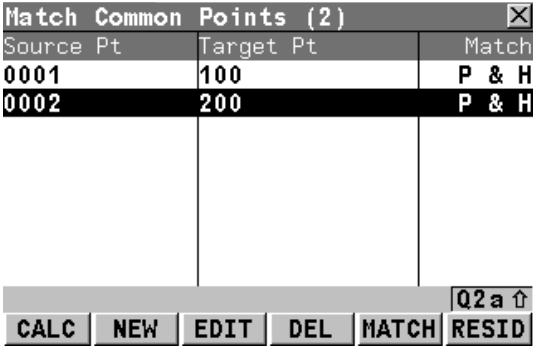
Number of pairs of points matched	Shift East	Shift North	Shift Height	Rotation	Scale
> 1	x	x	x	x	x

Access

Refer to "32.2 Accessing COGO" to access **COGO Match Common Points (n)**.

COGO Match Common Points (n)

This screen provides a list of points chosen from the active job. The points are used for the determination of the 2D Helmert transformation. The number of points matched is indicated in the title, for example **COGO Match Common Points (3)**. Unless there is no pair of matching points in the list all softkeys are available. Refer to paragraph "Match points step-by-step" for information on how to match points.



CALC (F1)
To confirm the selections, compute the transformation and continue with the subsequent screen.

NEW (F2)
To match a new pair of points. This pair is added to the list. A new point can be manually occupied. Refer to paragraph "Match points step-by-step".

EDIT (F3)
To edit the highlighted pair of matched points.

DEL (F4)
To delete the highlighted pair of matched points from the list.

MATCH (F5)
To change the type of match for a highlighted pair of matched points. Refer to "Description of columns".

RESID (F6)
To display a list of the matched points used in the transformation calculation and their associated residuals. Refer to paragraph "Fix parameters".

SHIFT PARAM (F5)
To define the parameters to be used in the 2D transformation.

Description of columns

Column	Description
Source Pt	The point ID of the points of origin for the calculation of the shifts and/or rotation and/or scale.
Target Pt	The point ID of the target points for the calculation of the shifts and/or rotation and/or scale.
Match	The type of match to be made between the points. This information is used in the transformation calculation. **P**osition **& H**eight, **P**osition **only**, **H**eight **only** or **None**. **None** removes matched common points from the transformation calculation but does not delete them from the list. This can be used to help improve residuals.

Next step

IF	THEN
the transformation is to be computed	**CALC (F1)**. The calculated shift, rotation and scale values are displayed in **COGO Shift, Rotate & Scale**. They cannot be edited. The remaining functionality of the calculation is very similar to COGO calculation shift, rotate & scale (manual). Refer to "32.9 COGO Calculation - Shift, Rotate & Scale (Manual) Method".
a pair of points is to be matched or edited	**NEW (F2)** or **EDIT (F3)**. Refer to paragraph "Match points step-by-step".
parameters for the transformation are to be fixed	**SHIFT PARAM (F5)**. Refer to paragraph "Fix parameters".

Match points step-by-step

Before calculating a transformation, it must be defined which points are to be matched. Matching new points and editing matched points is very similar.

Step	Description
1.	Refer to "32.2 Accessing COGO" to access **COGO Match Common Points**.
2.	**NEW (F2)** or **EDIT (F3)**
3.	**COGO Choose Matching Points** or **COGO Edit Matching Points** **<Source Pt:>** A point of origin for the calculation of the shifts and/or rotation and/or scale. **<Target Pt:>** A target point for the calculation of the shifts and/or rotation and/or scale.

Step	Description
	<Match Type:> The type of match to be made between the points selected in **<Source Pt:>** and **<Target Pt:>**. **Pos**ition **& Height**, **Pos**ition **Only**, **Height Only** or **None**. Select the points to be matched.
☞	**SURVY (F5)**. To manually occupy a point and store it in the active job.
4.	**CONT (F1)** returns to **COGO Match Common Points (n)** and adds a new line of matched points to the matched points list.

Fix parameters

The settings on this screen define the parameters to be used in the transformation.

IF the value for a field is	THEN the value for this parameter will be
-----	calculated.
any number	fixed to that value.

Description of fields

Field	Option	Description
<Δ Easting:>	User input	Shift in Easting direction.
<Δ Northing:>	User input	Shift in Northing direction.
<Δ Height:>	User input	Shift in Height direction.
<Rotation:>	User input	Rotation around the X axis.
<Scale:>	User input	Scale factor.

Next step

IF	AND	THEN
a field displays -----	the parameter needs to be fixed to a value	highlight the field. Enter the value of the parameter. **FIX (F4)**.
a field displays a value	the parameter needs to be calculated	highlight the field. **ADJST (F4)**.
all parameters are configured	-	**CONT (F1)** to return to **COGO Match Common Points (n)**.

32.11 Area Division

32.11.1 Overview

Description

The COGO calculation area division divides an area by a defined line, by percentage or by the size of a subarea.

The area division methods are listed in the table below. Elements that must be known for the calculation depend on the area division method. At least three points are required to form an area.

Divide by	Using		Elements required
Defined line	Parallel line	Through a point	• Two points defining the line • One point on the dividing line
		By a distance	• Two points defining the line • Distance
	Perpendicular line	Through a point	• Two points defining the line • One point on the dividing line
		By a distance	• Two points defining the line • Distance
Percentage	Parallel line	-	• Size of new area in percentage • Two points defining the line
	Perpendicular line	-	• Size of new area in percentage • Two points defining the line

Divide by	Using		Elements required
	Swing line	Rotation point	• Size of new area in percentage • Rotation point of the swing line
Area	Parallel line	-	• Size of new area • Two points defining the line
	Perpendicular line	-	• Size of new area • Two points defining the line
	Swing line	Rotation point	• Size of new area • Rotation point of the swing line

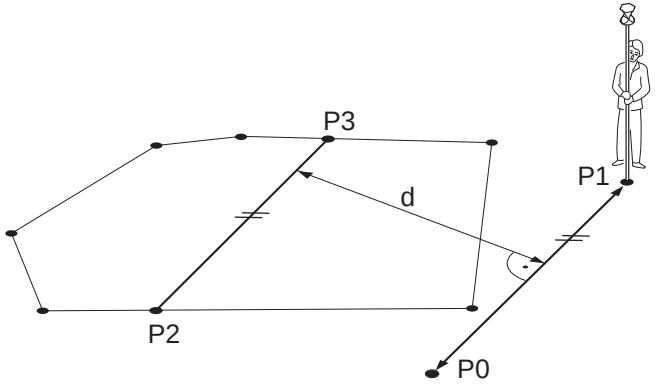
The coordinates of the known points

- may be taken from the active job.
- may be measured during the COGO calculation.
- may be entered.

Diagram

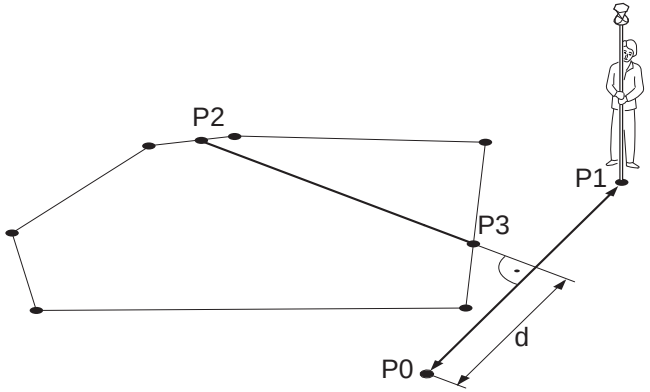
The diagrams show the area division methods. Some diagrams apply to several area division methods.

Area division method	<Divide:>	<Using:>	<Shift:>
1.	**By Defined Line**	**Parallel Line**	**By Distance**
2.	**By Percentage**	**Parallel Line**	-
3.	**By Area**	**Parallel Line**	-



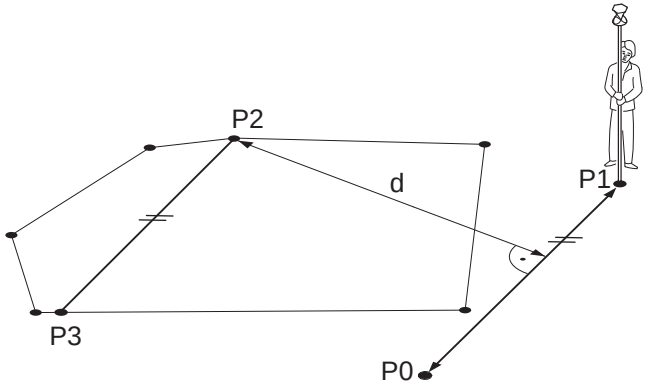
P0 **<Point A:>** of defined line
P1 **<Point B:>** of defined line
P2 First new COGO point
P3 Second new COGO point
d **<HDist-XX:>**

Area division method	<Divide:>	<Using:>	<Shift:>
1.	**By Defined Line**	**Perpendic Line**	**By Distance**
2.	**By Percentage**	**Perpendic Line**	-
3.	**By Area**	**Perpendic Line**	-



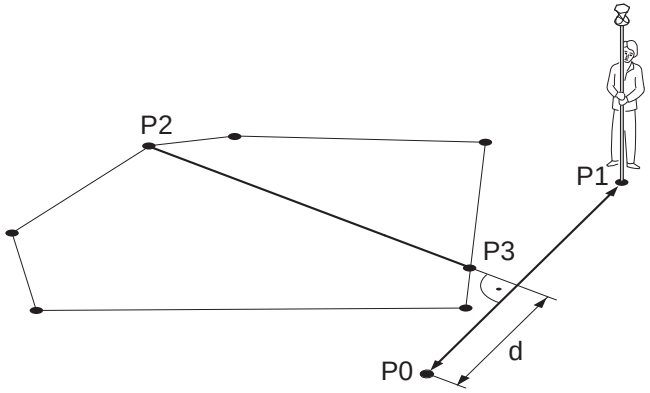
P0 **<Point A:>** of defined line
P1 **<Point B:>** of defined line
P2 First new COGO point
P3 Second new COGO point
d **<HDist-XX:>**

Area division method	<Divide:>	<Using:>	<Shift:>
1.	**By Defined Line**	**Parallel Line**	**Through Point**



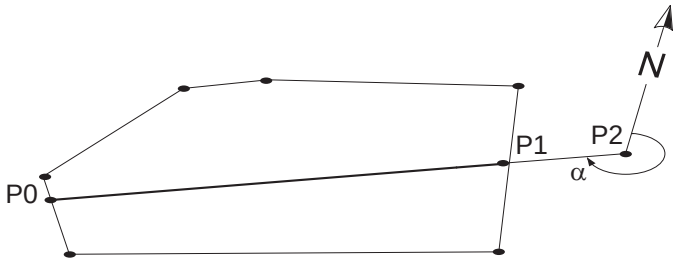
P0 **<Point A:>** of defined line
P1 **<Point B:>** of defined line
P2 **<Through Point:>**; in this case it is a known point of the existing border
P3 New COGO point
d **<HDist-XX:>**

Area division method	<Divide:>	<Using:>	<Shift:>
1.	**By Defined Line**	**Perpendic Line**	**Through Point**



P0 **<Point A:>** of defined line
P1 **<Point B:>** of defined line
P2 **<Through Point:>**; in this case it is a known point of the existing border
P3 New COGO point
d **<HDist-XX:>**

Area division method	<Divide:>	<Using:>	<Shift:>
1.	**By Percentage**	**Swing Line**	-
2.	**By Area**	**Swing Line**	-



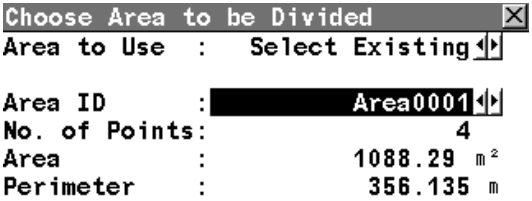
P0 First new COGO point
P1 Second new COGO point
P3 **<Rotation Pnt:>**
α **<Azimuth:>**

32.11.2 Choosing an Area to be Divided

Access

Refer to "32.2 Accessing COGO" to access **COGO Choose Area to be Divided**.

COGO
Choose Area to be Divided



CONT (F1)
To accept the changes and access the subsequent screen.

Description of fields

Field	Option	Description
<Area to Use:>		The setting determines the availability of the subsequent fields and screen.
	Select Existing	To use an area from the **<Job:>** selected in **COGO COGO Begin**. The area can be edited and a new area can be created from points existing in the **<Job:>**.
	Survey New Area	To survey points that do not exist in the job yet. The points will be added to a new area.

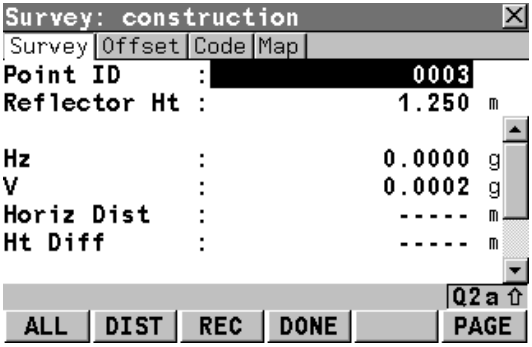
Field	Option	Description
<Area ID:>	Choicelist User input	For **<Area to Use: Select Existing>**. To select the area to be divided. For **<Area to Use: Survey New Area>**. To enter a name for the new area.
<No. of Points:>	Output	Number of points forming the area.
<Area:>	Output	The size of the selected area.
<Perimeter:>	Output	The perimeter of the area.

Next step

IF	THEN
<Area to Use: Select Existing>	**CONT (F1)** accesses **COGO Define How to Divide Area**. Refer to "32.11.3 Dividing an Area".
<Area to Use: Survey New Area>	**CONT (F1)** accesses **COGO Survey: Job Name**. Refer to "COGO Survey: Job Name, Survey page".

COGO
Survey: Job Name, Survey page

Points to be added to the new area can be surveyed.



ALL (F1)
To measure and store distances and angles.

DIST (F2)
To measure and display distances. Available unless **<EDM Mode: Tracking>** and/or **<Log Auto Pts: Yes>**, after the tracking or logging is started.

REC (F3)
To record data.
If **<EDM Mode: Tracking>** and/or **<Log Auto Pts: Yes>**, records measured point and continues tracking.

DONE (F4)
To end surveying an area and to access **COGO Edit Area: Area ID** where the area can be stored.

PAGE (F6)
To change to another page on this screen.

SHIFT INDIV (F5) and **SHIFT RUN (F5)**
To change between entering an individual point ID different to the defined ID template and the running point ID according to the ID template. Refer to "15.1 ID Templates".

Description of fields

Field	Option	Description
<Point ID:>	User input	The identifier for manually occupied points. The configured point ID template is used. The ID can be changed in the following ways: • To start a new sequence of point ID's type over the point ID. • For an individual point ID independent of the ID template **SHIFT INDIV (F5)**. **SHIFT RUN (F5)** changes back to the next ID from the configured ID template. Refer to "15.1 ID Templates".
<Reflector Ht:>	User input	The last used reflector height is suggested when accessing the Survey application program. An individual reflector height can by typed in.
<Hz:>	Output	The current horizontal angle.
<V:>	Output	The current vertical angle.
<Horiz Dist:>	Output	The horizontal distance after **DIST (F2)** was pressed. No distance is displayed when accessing the screen and after **REC (F3)** or **ALL (F1)**.
<Ht Diff:>	Output	The height difference between station and measured point after **DIST (F2)**. Displays ----- when accessing the screen and after **REC (F3)** or **ALL (F1)**.

Next step

IF the task is to	THEN
change to another page on this screen	**PAGE (F6)**.
stop surveying the area and to store the area	**DONE (F4)** and then **STORE (F1)**. **COGO Define How to Divide Area** is accessed. Refer to "32.11.3 Dividing an Area".
return to **COGO Choose Area to be Divided**	**ESC**.

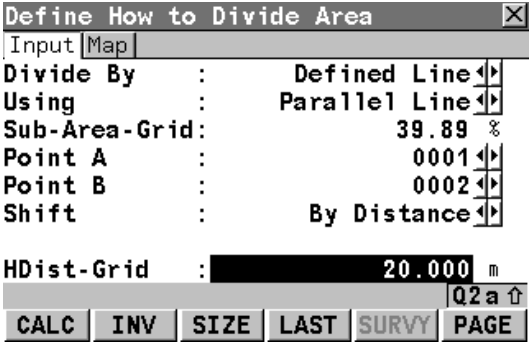
32.11.3 Dividing an Area

Access

Refer to "32.11.2 Choosing an Area to be Divided" to access **COGO Define How to Divide Area**.

COGO Define How to Divide Area, Input page

After each change of parameters in this screen, the values in the output fields are recalculated and updated.



CALC (F1)
To perform the area division and to continue with the subsequent screen. Calculated COGO points are not yet stored.

INV (F2)
To calculate the value for the distance from two existing points. Available if **<HDist-XX:>** is highlighted.

SIZE (F3) and **PERC (F3)**
To display the size and the perimeter of the sub-area.

LAST (F4)
To select the value for the distance from previous COGO inverse calculations. Available if **<HDist-XX:>** is highlighted.

SURVY (F5)
To manually occupy a point for the COGO calculation. Available if **<Point A:>**, **<Point B:>** or **<Rotation Pnt:>** is highlighted.

PAGE (F6)
To change to another page on this screen.

SHIFT CONF (F2)
To configure the COGO application program.

SHIFT MODIF (F4)
To mathematically modify the values for the distance or angle. Available if **<HDist-XX:>** or **<Azimuth:>** is highlighted.

Description of fields

Field	Option	Description
<Divide By:>		This field defines how the size of the sub area is defined.
	Percentage	The size of the sub area is given in %.
	Area	The size of the sub area is given in m^2.
	Defined Line	The new border defining the size of the sub area is known.
<Using:>		This field defines how the new border will run.
	Parallel Line	The border will be parallel to a line defined by **<Point A:>** and **<Point B:>**.
	Perpendic Line	The border will be perpendicular to a line defined by **<Point A:>** and **<Point B:>**.
	Swing Line	The border will be a line rotated around **<Rotation Pnt:>** by **<Azimuth:>**.
<Sub-Area-XX:>	User input	For **<Divide By: Percentage>** and **<Divide By: Area>**. The size of the sub area must be typed either in % or in m^2.

Field	Option	Description
		When dividing the area using a parallel or perpendicular line, a reference line is defined by **<Point A:>** and **<Point B:>**. The direction of the new dividing line is always the same as the direction of the reference line. The sub area is always to the left of the new dividing line. When dividing a line using a swing line, the direction of the new dividing line is defined by the **<Rotation Pnt:>** and the **<Azimuth:>**. The sub area is always to the left of the new dividing line.
	Output	For **<Divide By: Defined Line>**. The size of the sub area is calculated in the background and displayed.
<Point A:>	Choicelist	The first point of the line which is used as the reference for a new parallel or perpendicular border. All points from **COGO Data: Job Name** can be selected.
<Point B:>	Choicelist	The second point of the line which is used as the reference for a new parallel or perpendicular border. All points from **COGO Data: Job Name** can be selected.
<Shift:>		Available for **<Divide By: Defined Line>**.
	By Distance	The new border will run in a certain distance from the line defined by **<Point A:>** and **<Point B:>**.
	Through Point	The new border will run through a point defined in **<Through Point:>**.

Field	Option	Description
<Through Point:>	Choicelist	Available for **<Shift: Through Point>**. The point through which the new border will run.
<Rotation Pnt:>	Choicelist	Available for **<Using: Swing Line>**. The point around which the new border will rotate by **<Azimuth:>**.
<Azimuth:>	Output	Available for **<Using: Swing Line>**. The angle of the new border from **<Rotation Pnt:>** to the new COGO point.
<HDist-XX:>		The distance from the line defined by **<Point A:>** and **<Point B:>** to the new border.
	User Input	For **<Divide By: Defined Line>** and **<Shift: By Distance>**.
	Output	For **<Divide By: Percentage>** or**<Divide By: Area>** with **<Using: Parallel Line>** or **<Using: Perpendic Line>**.

Next step

PAGE (F6) changes to the **Map** page. Refer to paragraph "COGO Define How to Divide Area, Map page".

COGO
Define How to Divide Area,
Map page

The **Map** page provides an interactive display of the data. Refer to "30 MapView Interactive Display Feature" for information on the functionality and softkeys available.

Next step

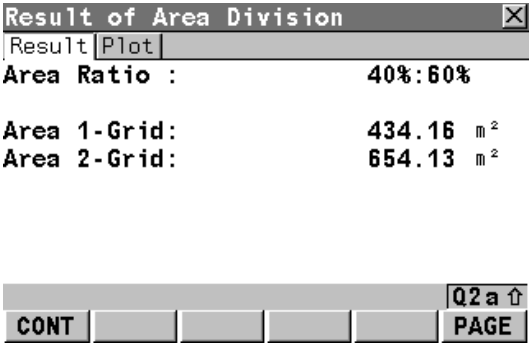
CALC (F1) performs the area division and accesses **COGO Results of Area Division**. Refer to "32.11.4 Results of the Area Division".

32.11.4 Results of the Area Division

Access

CALC (F1) in **COGO Define How to Divide Area**.

COGO
Results of Area Division, Result page



CONT (F1)
To accept the calculation and to continue with the subsequent screen. Calculated COGO points are not yet stored.

PAGE (F6)
To change to another page on this screen.

SHIFT CONF (F2)
To configure the COGO application program.

Description of fields

Field	Option	Description
<Area Ratio:>	Output	The ratio of the size of the two sub areas in percent.
<Area 1-XX:>	Output	The size of the first sub area in m^2.
<Area 2-XX:>	Output	The size of the second sub area in m^2.

Next step
PAGE (F6) changes to the **Plot** page.

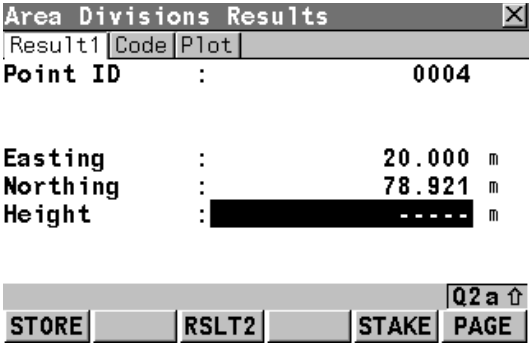
COGO
Results of Area Division, Map page

The points defining the area and the calculated COGO points are shown in black.

Next step
CONT (F1) access **COGO Area Division Results**.

COGO
Area Division Results, ResultX page

The coordinates of the intersection points of the new border with the original area are displayed.



STORE (F1)
To store the two results and to return to **COGO Choose Area to be Divided** once both points are stored

RSLT1 (F3) or **RSLT2 (F3)**
To view the first and second result.

STAKE (F5)
To access the Stakeout application program and stake out the calculated COGO point.

PAGE (F6)
To change to another page on this screen.

SHIFT INDIV (F5) and **SHIFT RUN (F5)**
To change between entering an individual point ID different to the defined ID template and the running point ID according to the ID template. Refer to "15.1 ID Templates".

Description of fields

Field	Option	Description
<Point ID:>	User input	The identifier for the COGO point depending on the point ID template configured for **<Survey Pts:>** in **CONFIGURE ID Templates**.
<Height:>	User input	A height value to be stored with the calculated point can be typed in.

Next step
PAGE (F6) changes to the **Code** page.

COGO
Area Division Results, Code page

All codes of the job can be selected. Type in a code if required.

Next step
PAGE (F6) changes to the **Plot** page.

COGO
Area Division Results, Plot page

The points defining the area and the points of the new border are shown in black.

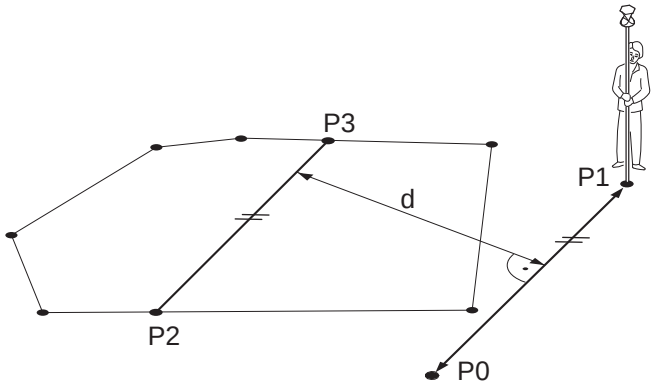
Next step
STORE (F1) stores the results and accesses **COGO Choose Area to be Divided**. For **<Write Logfile: Yes>** in **COGO Configuration**, **Logfile** page the result is written to the logfile.

32.11.5 Working Example

Description

Application:	Divide an area by a defined, parallel line. The new border has to run through a known point with the point ID 100.
Goal:	The points forming the original area are to be picked. The area division is to be calculated.

Diagram



P0 **<Point A:>** of defined line
P1 **<Point B:>** of defined line
P2 First new COGO point
P3 Second new COGO point
d **<HDist-XX:>**

Field procedure step-by-step

Step	Description
1.	**Main Menu: Programs...\COGO**
2.	**COGO COGO Begin** Select a job and a configuration set with the settings mentioned above.
☞	**CONF (F2)** to configure the COGO application program.

Step	Description
3.	**CONT (F1)** to access **COGO COGO Menu**.
4.	Highlight **Area Division**.
5.	**CONT (F1)** to access **COGO Choose Area to be Divided**.
6.	**COGO Choose Area to be Divided** **<Area to Use: Survey New Area>** **<Area ID:>** Type in an ID for the new area.
7.	**CONT (F1)** to access **COGO Survey: Job Name**.
8.	**COGO Survey: Job Name** **<Point ID:>** Type in a name for the first point of the area.
9.	**ALL (F1)** to measure and store the first point of the area.
10.	Survey all points belonging to the area. Point 100 must be part of the points.
11.	**DONE (F4)** once all points are surveyed.
12.	**COGO Edit Area: Area ID** Check the points forming the area.
13.	**STORE (F1)** to store the area and to access **COGO Define How to Divide Area**.
14.	**COGO Define How to Divide Area**, **Input** page **<Divide By: Defined Line>** **<Using: Parallel Line>** **<Point A:>** and **<Point B:>** Select the first and the second point of the line which is used as the reference for the new border. The new border will run parallel to this line.

Step	Description
	<Shift: Through Point> **<Through Point: 100>**
15.	**CALC (F1)** to access **COGO Results of Area Division**.
16.	**COGO Results of Area Division**, **Result** page The size of the two new sub areas is displayed,
17.	**CONT (F1)** to access **COGO Area Division Results**.
18.	**COGO Area Division Results**, **Result1** page **<Point ID:>** The identifier for the first COGO point depending on the point ID template configured for **<Survey Pts:>** in **CONFIGURE ID Templates**. The point ID can be changed. The calculated coordinates are displayed. Type in a point ID.
☞	**COORD (F2)** views other coordinate types.
☞	**RSLT1 (F3)** and **RSLT2 (F3)** to view the first and second result.
☞	**STAKE (F5)** to access the Stakeout application program and stake out the calculated COGO point.
☞	**SHIFT INDIV (F5)** for an individual point ID independent of the ID template. **SHIFT RUN (F5)** changes back to the next ID from the configured ID template.
19.	**STORE (F1)** stores the first COGO point and displays the coordinates of the second COGO point.
20.	**STORE (F1)** stores the second COGO point and returns to **COGO Choose Area to be Divided**.

Step	Description
21.	**SHIFT QUIT (F6)** to exit the COGO application program.

32.12 Selecting a Result from Previous COGO Inverse Calculations

Description

Azimuths, distances and offsets required within the COGO traverse and intersection calculations can be selected from previously calculated inverse results.

Select a result from previous COGO inverse calculations step-by-step

Step	Description
1.	Refer to "32.2 Accessing COGO" to access **COGO Traverse Input** or **COGO Intersection Input**.
2.	**COGO XX Input**, **Input** page Highlight **<Azimuth:>**, **<HDist-XX:>** or **<Offset:>**.
3.	**LAST (F4)** to access **COGO Last Inverse Calculations**.
4.	**COGO Last Inverse Calculations** All previous COGO inverse calculations stored in the active job are displayed, sorted by time with the most recent at the top. This screen consists of three columns. • First column **From**: The point ID of the first known point for the COGO inverse calculation. • Second column **To**: The point ID of the second known point for the COGO inverse calculation. • Third column: The information displayed can vary. ----- is displayed for unavailable information, for example if a height only point is used, **Azimuth** cannot be calculated. **Azimuth**: The direction from the first to the second known point. **HDist-XX**: The horizontal distance between the two known points.

Step	Description
	Date and **Time** when the COGO inverse calculation was stored.
☞	**VIEW (F3)** to view all calculated values for the highlighted COGO inverse calculation. This includes the height difference, the slope distance, the grade and the coordinate differences between the two known points.
☞	**DEL (F4)** to delete the highlighted COGO inverse calculation.
☞	**MORE (F5)** to display other information in the third column.
5.	Highlight the COGO inverse calculation of which a result is to be taken over into **COGO XX Input**, **Input** page.
6.	**CONT (F1)** to return to **COGO XX Input**, **Input** page.
☞	The relevant result of the highlighted COGO inverse calculation is copied into the field which was initially highlighted in **COGO XX Input**, **Input** page.

32.13 Modifying Values for Azimuths, Distances and Offsets

Description

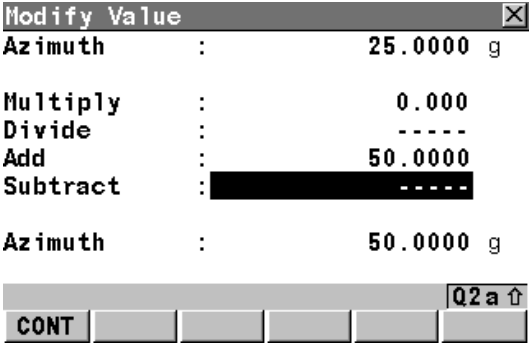
The values for the azimuth, the distance and the offset required within the COGO traverse and intersection calculation can be mathematically modified.

Access step-by-step

Step	Description
1.	Refer to "32.2 Accessing COGO" to access **COGO Traverse Input** or **COGO Intersection Input**.
2.	**COGO XX Input**, **Input** page Highlight **<Azimuth:>**, **<HDist-XX:>** or **<Offset:>**.
3.	**SHIFT MODIF (F4)** to access **COGO Modify Value**.

COGO Modify Value

On this screen numbers can be typed in for the multiplication, division, addition and subtraction with the original azimuth, distance or offset value. The standard rules of mathematical operations apply.



CONT (F1)

To accept the modified value and to return to the screen from where this screen was accessed. The modified value is copied into the field which was initially highlighted in **COGO XX Input**, **Input** page.

Description of fields

Field	Option	Description
<Azimuth:>, **<HDist-XX:>** or **<Offset:>**	Output	The name of the field and the value which was highlighted before accessing **COGO Modify Value**.
<Multiply:>	User input	The number to multiply by. • Minimum: -3000 • Maximum: 3000 • ----- performs a multiplication by 1.
<Divide:>	User input	The number to divide by. • Minimum: -3000 • Maximum: 3000 • ----- performs a division by 1.
<Add:>	User input	The number to be added. • For azimuths Minimum: 0 Maximum: Full circle • For distances and offsets Minimum: 0 m Maximum: 30000000 m • ----- performs an addition of 0.000.

Field	Option	Description
<Subtract:>	User input	The number to be subtracted. • For azimuths Minimum: 0 Maximum: Full circle • For distances and offsets Minimum: 0 m Maximum: 30000000 m • ----- performs a subtraction of 0.000.
<Azimuth:>, **<HDist-XX:>** or **<Offset:>**	Output	The modified value for the field in the first line. This field is updated with every mathematical operation. Angles greater than the full circle are reduced accordingly.

Next step

CONT (F1) accepts the modified value and returns to the screen from where this screen was accessed.

Example: Calculations for an azimuth

Step	User input	Value as calculated	Value as displayed
☞			**<Azimuth: 250.0000> g**
1.	**<Multiply: 2>**	500	**<Azimuth: 100.0000> g**
2.	**<Divide: 3>**	166.667	**<Azimuth: 166.6670> g**
3.	**<Add: 300>**	466.667	**<Azimuth: 66.6670> g**
4.	**<Subtract: 100>**	366.667	**<Azimuth: 366.6670> g**

Example: Calculations for a distance

The behaviour for an offset is identical.

Step	User input	Value as calculated	Value as displayed
☞			**<HDist-Grid: 250.000> m**
1.	**<Multiply: 2>**	500	**<HDist-Grid: 500.000> m**
2.	**<Divide: 3>**	166.667	**<HDist-Grid: 166.667> m**
3.	**<Add: 300>**	466.667	**<HDist-Grid: 466.667> m**
4.	**<Subtract: 100>**	366.667	**<HDist-Grid: 366.667> m**

33 Setup

33.1 Overview

Description

The Setup program is used when setting up a TPS station, to determine the TPS station coordinates and setting the TPS orientation.

Setup methods

- Set Azimuth
- Known Backsight Point
- Orientation & Height Transfer
- Resection
- Resection Helmert
- Local Resection

Each setup method requires different input data and a different number of target points.
All setup methods are described in "33.4 Setup Methods".

Properties of setup points

Type	Station	Target
Class	**REF**	**MEAS** or **NONE**
Sub class	**TPS**	**TPS**
Source	**Setup (setup method)**	**Setup (setup method)**
Instrument source	**TPS**	**TPS**

33.2 Accessing Setup

Access

Select **Main Menu: Programs...\Setup**.

OR

Press **ON**. Highlight **Setup**. **CONT (F1)**.

Refer to "31.2 Accessing the Programs Menu" for details on the **ON** key.

OR

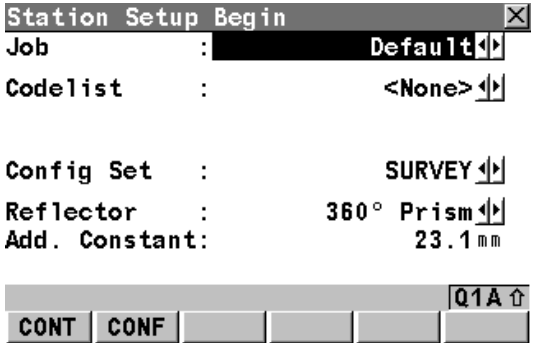
Press **USER** (configuring the User Menu to include the Setup program).

Refer to "2 USER Key" for details on the **USER** key.

OR

Press **SETUP (F3)** in the **Begin** screen of another program (other than Setup).

SETUP
Station Setup Begin



CONT (F1)
To accept changes and access the subsequent screen. The chosen settings become active.

CONF (F2)
To configure the Setup application program. Accesses **SETUP Configuration**. Refer to "33.3 Configuring Setup".

Description of fields

Field	Option	Description
<Job:>	Choicelist	The active job. All jobs from **Main Menu: Manage...\Jobs** can be selected.
<Codelist:>	Choicelist	No codes are stored in the selected job. All codelists from **Main Menu: Manage...\Codelists** can be selected.
	Output	Codes have already been stored in the selected job. If codes had been copied from a System RAM codelist, then the name of the codelist is displayed. If codes have not been copied from a System RAM codelist but typed in, then the name of the active job is displayed.
<Config Set:>	Choicelist	The active configuration set. All configuration sets from **Main Menu: Manage...\Configuration Sets** can be selected.
<Reflector:>	Choicelist	The reflector currently set in the selected configuration set. All reflectors from **Main Menu: Manage...\Reflectors** can be selected.
<Add. Constant:>	Output	The additive constant stored with the chosen reflector.

Next step

IF the Setup application program	THEN
is to be accessed	**CONT (F1)** to accept the changes and continue.
is to be configured	**CONF (F2)**. Refer to "33.3 Configuring Setup".

33.3 Configuring Setup

Access

Select **Main Menu: Programs...\Setup**.

In SETUP Station Setup Begin press **CONF (F2)** to access **SETUP Configuration**.

OR

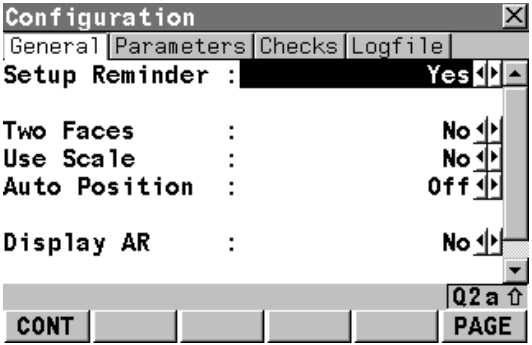
Press **ON**. Highlight **Setup**. **CONT (F1)**.

In SETUP Station Setup Begin press **CONF (F2)** to access **SETUP Configuration**.

OR

Press **SHIFT CONF (F2)** in **SETUP Station Setup**.

SETUP Configuration, General page



CONT (F1)
To accept changes and return to the screen from where this screen was accessed.

PAGE (F6)
To change to another page on this screen.

SHIFT ABOUT (F5)
To display information about the program name, the version number, the date of the version, the copyright and the article number.

Description of fields

Field	Option	Description
<Setup Reminder:>	Choicelist	Current instrument setup details can be displayed to remind the user to either keep the current instrument setup or to create a new instrument setup. Refer to "33.4.1 Setup Reminder" for details.
	Yes	Whenever **CONT (F1)** is pressed in a **Begin** screen, the current setup information is displayed.
	No	Whenever **CONT (F1)** is pressed in a **Begin** screen, the current setup information is not displayed and the program continues as normal.
<Two Faces:>	Choicelist	Defines if the instrument measures the second face automatically after storing the first.
	Yes	After storing a measurement with **ALL (F1)** or **REC (F3)** motorised instruments change face automatically, non-motorised instruments access **SETUP Telescope Positioning**. The measurements of face I and face II are averaged on the base of face I. The averaged value is stored.
	No	No automatic measurement in two faces. For the setup methods **<Method: Set Azimuth>** or **<Method: Known BS Point>** the selected option in the field **<Two Faces:>** is ignored. For these setup methods, measurements are not made in two faces.

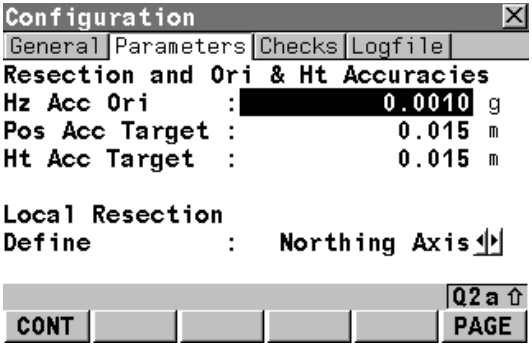
Field	Option	Description
<Use Scale:>	Choicelist	The appearance of the **SETUP Results** screen differs with this setting.
	Yes	The calculated scale factor and ppm value from the resection and orientation and height transfer calculation are displayed in the **SETUP Results, Sigma** page. The ppm value may be set in the system as the geometric ppm value. In **SETUP Station Setup** the **<Current Scale:>** is displayed and **PPM (F5)** is available.
	No	The calculated scale factor from the resection calculation is displayed in the **SETUP Results, Sigma** page but cannot be set as the geometric ppm value.
<Auto Position:>	**2D**	Instrument positions horizontally to the point.
	3D	Instrument positions horizontally and vertically to the point.
	Off	Instrument does not position to the point.
<Display AR:>	Choicelist	To set the direction to the backsight point to zero.
	Yes	Sets **<AR: 0.0000>** towards the backsight point. If set in the current display mask, **<AR:>** displays the horizontal angle difference between the backsight point and the measured point. This has no effect on the set orientation.

Field	Option	Description
	No	Does not set a value for **<AR:>**. If the display mask is configured to display **<AR:>** in the Survey application program, the value is identical to the azimuth. If **<Set Angle Right: Yes>** and more than one backsight point is used, the behaviour is as for **<Set Angle Right: No>**.

Next step

PAGE (F6) changes to the **Parameters** page.

SETUP
Configuration,
Parameters page



CONT (F1)
To accept changes and return to the screen from where this screen was accessed.

PAGE (F6)
To change to another page on this screen.

SHIFT ABOUT (F5)
To display information about the program name, the version number, the date of the version, the copyright and the article number.

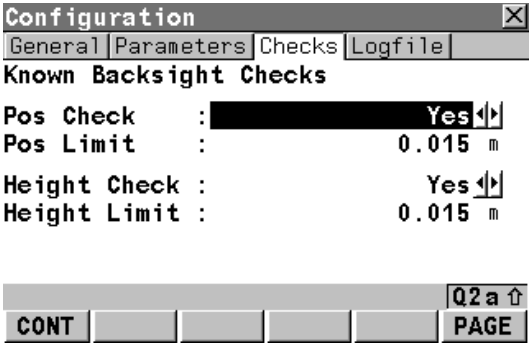
Description of fields

Field	Option	Description
When **<Method: Resections>** or **<Method: Ori & Ht Transfer>**, the following fields apply:		
<Hz Acc Ori:>	User input	For Resection or Orientation and Height Transfer. Limit for the standard deviation of the orientation for resection and orientation and height transfer.
<Pos Acc Target:>	User input	For Resection or Orientation and Height Transfer. Position accuracy of the target point for resection and orientation and height transfer.
<Ht Acc Target:>	User input	For Resection or Orientation and Height Transfer. Height accuracy of the target point for resection and orientation and height transfer.
When **<Method: Local Resection>**, the following fields apply:		
<Define:>	Choicelist	For Local Resection. To define the positive North or positive East axis.
	Northing Axis	The second point measured defines the direction of the positive North axis.
	Easting Axis	The second point measured defines the direction of the positive East axis.
When **<Method: Resection Helmert>**, the following fields apply:		
<Weighting:>	**1/Distance** or **1/Distance**^{2}	To change the distance weighting that is used in the calculation of the station height in the resection.

Next step

PAGE (F6) changes to the **Checks** page.

SETUP
Configuration,
Checks page



CONT (F1)
To accept changes and return to the screen from where this screen was accessed.

PAGE (F6)
To change to another page on this screen.

SHIFT ABOUT (F5)
To display information about the program name, the version number, the date of the version, the copyright and the article number.

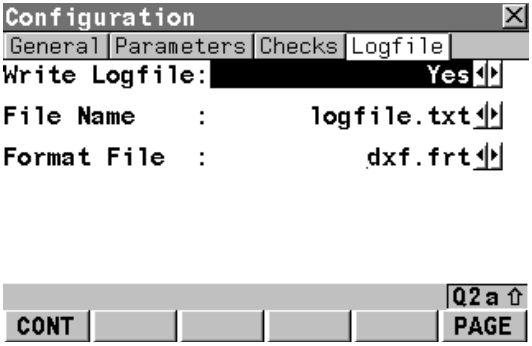
Description of fields

Field	Option	Description
When **<Method: Known BS Point>**, the following fields apply:		
<Pos Check:>	**Yes** or **No**	Allows a check to be made on the horizontal coordinate difference between the existing and the measured known backsight point. If the defined **<Pos Limit:>** is exceeded, the setup can be repeated, skipped or stored.
<Pos Limit:>	User input	Available for **<Pos Check: Yes>**. Sets the maximum horizontal coordinate difference accepted in the position check.

Field	Option	Description
<Height Check:>	**Yes** or **No**	Allows a check to be made on the vertical difference between the existing and the measured known back-sight point. If the **<Height Limit:>** is exceeded, the stakeout can be repeated, skipped or stored.
<Height Limit:>	User input	Available for **<Height Check: Yes>**. Sets the maximum vertical difference accepted in the height check.

Next step
PAGE (F6) changes to the **Logfile** page.

SETUP
Configuration,
Logfile page



CONT (F1)
To accept changes and return to the screen from where this screen was accessed.

PAGE (F6)
To change to another page on this screen.

SHIFT ABOUT (F5)
To display information about the program name, the version number, the date of the version, the copyright and the article number.

Description of fields

Field	Option	Description
<Write Logfile:>	**Yes** or **No**	To generate a logfile when the application program is exited. A logfile is a file to which data from an application program is written to. It is generated using the selected **<Format File:>**.
<File Name:>	Choicelist	Available for **<Write Logfile: Yes>**. The name of the file to which the data should be written. A logfile is stored in the \DATA directory of the active memory device. The data is always appended to the file. Opening the choicelist accesses **Logfiles** where a name for a new logfile can be created and an existing logfile can be selected or deleted.
<Format File:>	Choicelist	Available for **<Write Logfile: Yes>**. A format file defines which and how data is written to a logfile. Format files are created using Stonex® Tools. A format file must first be transferred from the CompactFlash card to the System RAM before it can be selected. Refer to "22 Tools...\Transfer Objects..." for information on how to transfer a format file. Opening the choicelist accesses **Format Files** where an existing format file can be selected or deleted.

Next step

PAGE (F6) changes to the first page on this screen.

33.4 Setup Methods

33.4.1 Setup Reminder

Description

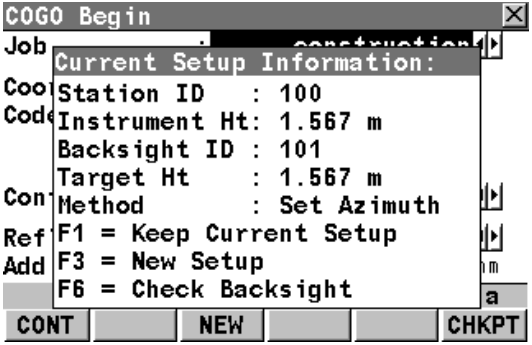
- When activated, the setup reminder function displays a screen which enables the user to check the current station setup details before proceeding with the survey. When this screen appears, three options are available to the user:
  - 1. To keep the current station setup and proceed with the survey.
  - 2. To create a new station setup.
  - 3. To check the backsight point.
- The setup reminder function is available to every application program, except:
  - Alignment Tool Kit
  - Setup

Access

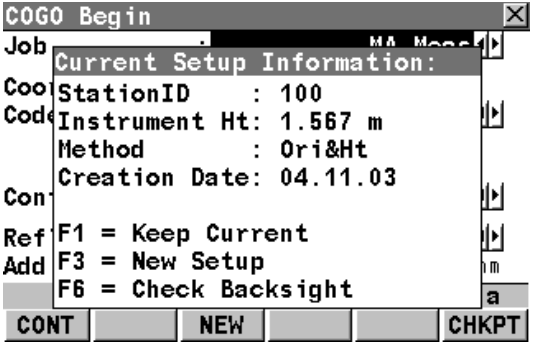
When the setup reminder function is activated (refer to "33.3 Configuring Setup"), the current station setup details are displayed whenever **CONT (F1)** is pressed in a **Begin** screen in an application program.

Setup Reminder screen

Reminder for setup method
- Set Azimuth
- Known BS Point



Reminder for setup method
- Ori & Ht Transfer
- Resection
- Resection Helmert
- Local Resection



Description of softkeys

Softkey	Description
CONT (F1)	To continue with the existing program.
NEW (F3)	To start the Setup program and create a new station setup.
CHKPT (F6)	To open the Check Recorded Pt/Backsight Pt screen.

33.4.2 Set Azimuth

Requirements

- The position coordinates of the station point are required. The instrument is set up and oriented to either a known or unknown target point, to which a true or assumed azimuth is set.

Updating Hz measurements

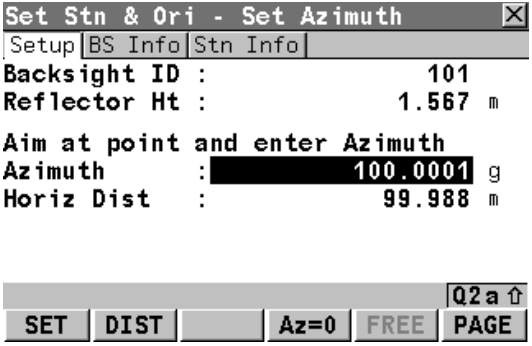
- A station setup using this setup method is always automatically flagged with an 'update later' attribute. Therefore, all angle measurements taken from that station are always automatically updated.

Access step-by-step

- This screen can be accessed from the **SETUP Station Setup** screen or by pressing **SETAZ (F5)** in the **SURVEY Survey** screen. The step-by-step description is for access from the **SETUP Station Setup** screen.
- Refer to the stated chapter for more information on screens.

Step	Description	Refer to chapter
1.	Press **ON** to access the **Programs** menu.	
2.	Select and activate **Setup** to move to the first screen.	
3.	Press **CONT (F1)** to access **SETUP Station Setup**.	
4.	**<Method:>** Ensure that **Set Azimuth** is selected. **<Station Coord:>** Select the source for the instrument station coordinates. **<Station ID:>** Enter/Select the instrument station. **<Instrument Ht:>** Enter the height of the instrument station. **<Fixpoint Job:>** Select the fixpoint job of the control/target points.	
5.	The geometric scale correction is displayed. The correction displayed depends upon the options chosen in **CONFIGURE TPS Corrections, GeoPPM** page: • if **<Calc Scale: Automatically>**, **<Computd Scale:>** is displayed. • if **<Calc Scale: Manually>**, **<Current Scale:>** is displayed.	16.4
6.	Press **CONT (F1)** to access **SETUP Set Stn & Ori - Set Azimuth**.	

SETUP
Set Stn & Ori - Set Azimuth, Setup page



SET (F1)
To set the station and orientation and exit the Setup application program.

DIST (F2)
To measure a distance to the point being used to set the azimuth. A distance measurement is **NOT** required when setting the Station and the Orientation **SET (F1)**. Checking is **NOT** performed on the distance measurement when setting the Station and the Orientation **SET (F1)**.

Az=0 (F4)
Available on the **Setup** page. To set **<Azimuth: 0>** and running. This value is not set to the system until **SET (F1)** is pressed.

HOLD (F5) or **FREE (F5)**
Available on the **Setup** page and if **<iLock: Off>**. **HOLD (F5)** freezes the current **<Azimuth:>** value, making it possible to set the **<Azimuth:>** value first, turn the instrument to the desired direction and release the **<Azimuth:>** value using **FREE (F5)**.

PAGE (F6)
To change to another page on this screen.

SHIFT INDIV (F5) and **SHIFT RUN (F5)**
Available on the **Setup** page. To change between entering an individual backsight point ID different to the defined ID template and the running point ID according to the ID template. Refer to "15.1 ID Templates" for more information on point ID templates.

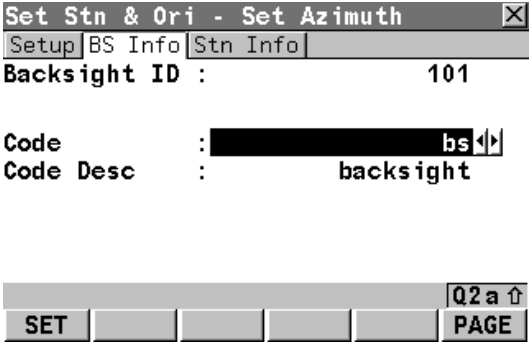
Description of fields

Field	Option	Description
<Backsight ID:>	User input	Point ID of the backsight point according to the point ID template.
<Reflector Ht:>	User input	The default reflector height as defined in the active configuration set is suggested.
<Azimuth:>	User input	The current system azimuth value. If a different azimuth is typed in and **ENTER** is pressed or if **Az=0 (F4)** is pressed, this azimuth value is displayed in the field and updated with the telescope movement. The value is not set to the system until **SET (F1)** is pressed.
<Horiz Dist:>	Output	Press **(F2)** to measure a distance to the target point being used to set the azimuth.

Next step

IF	THEN
the next page is to be accessed	**PAGE (F6)** changes to the **BS Info** page.
the station and orientation is to be set	**SET (F1)** to set the station and orientation.

SETUP
Set Stn & Ori - Set Azimuth, BS Info page



SET (F1)
To set the station and orientation and exit the Setup application program.

PAGE (F6)
To change to another page on this screen.

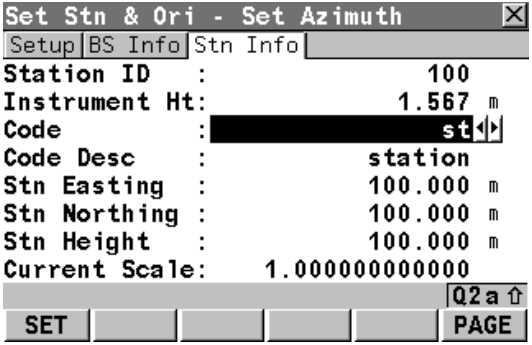
Description of fields

Field	Option	Description
<Backsight ID:>	Output	Backsight ID as entered in **SETUP Station Setup**.
<Code:>	Choicelist	The code for the backsight point.
<Code Desc:>	Output	A short description of the code.

Next step

IF	THEN
the next page is to be accessed	**PAGE (F6)** changes to the **Stn Info** page.
the station and orientation is to be set	**SET (F1)** to set the station and orientation.

SETUP
Set Stn & Ori - Set Azimuth, Stn Info page



SET (F1)
To set the station and orientation and exit the Setup application program.

PAGE (F6)
To change to another page on this screen.

Description of fields

Field	Option	Description
<Station ID:>	Output	Station ID as selected in **SETUP Station Setup**.
<Instrument Ht:>	User input	The instrument height.
<Code:>	Choicelist	The code for the station point.
<Code Desc:>	Output	A short description of the code.
<Stn Easting:>	Output	The easting coordinate for the setup station.
<Stn Northing:>	Output	The northing coordinate for the setup station.
<Stn Height:>	Output	The height of the setup station.

Field	Option	Description
<Current Scale:>	Output	The geometric scale correction is displayed. The correction displayed depends upon the options chosen in **CONFIGURE TPS Corrections, GeoPPM** page. Refer to "16.4 TPS Corrections" for details.

Next step

IF	THEN
the next page is to be accessed	**PAGE (F6)** changes to the **Setup** page.
the station and orientation is to be set	**SET (F1)** to set the station and orientation.

Set azimuth step-by-step

Application: Set up the instrument over a known point with orientation to a point with known azimuth.

Settings: Set **<Automation: iLock>** in **CONFIGURE EDM & iLock Settings**.

The following table explains the most common settings. Refer to the stated chapter for more information on screens.

Step	Description	Refer to chapter
1.	Access **SETUP Set Stn & Ori - Set Azimuth**.	33.4.2
2.	**SETUP Set Stn & Ori - Set Azimuth, Setup** page **<Azimuth:>** The azimuth to the backsight point. **<Backsight ID:>** The point ID of the backsight point. **<Reflector Ht:>** The current reflector height. Aim at the reflector on the backsight point.	
3.	**SET (F1)** to set the station and orientation and return to **Main Menu**.	

33.4.3 Known Backsight Point

Requirements

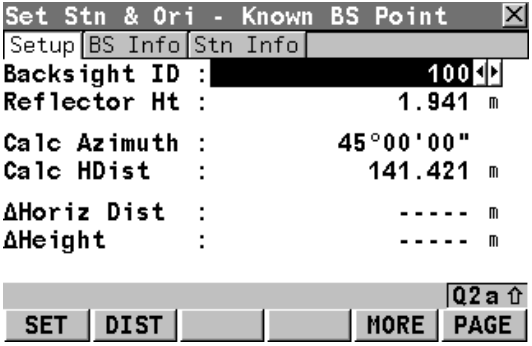
- The position coordinates of the station point are required. The instrument is set up and oriented to a known backsight target.

Access step-by-step

Refer to the stated chapter for more information on screens.

Step	Description	Refer to chapter
1.	Press **ON** to access the **Programs** menu.	
2.	Select and activate **Setup** to move to the first screen.	
3.	Press **CONT (F1)** to access **SETUP Station Setup**.	
4.	**<Method:>** Ensure that **Known BS Point** is selected. **<Station Coord:>** Select the source for the instrument station coordinates. **<Station ID:>** Enter/Select the instrument station. **<Instrument Ht:>** Enter the height of the instrument station. **<Fixpoint Job:>** Select the fixpoint job of the control/target points.	
5.	The geometric scale correction is displayed. The correction displayed depends upon the options chosen in **CONFIGURE TPS Corrections, GeoPPM** page: • if **<Calc Scale: Automatically>**, **<Computd Scale:>** is displayed. • if **<Calc Scale: Manually>**, **<Current Scale:>** is displayed.	16.4
6.	Press **CONT (F1)** to access **SETUP Set Stn & Ori - Known BS Point**.	

SETUP
Set Stn & Ori - Known BS Point, Setup page



SET (F1)
To set the station and orientation and exit the Setup application program.

DIST (F2)
To measure the distance to the backsight point.

MORE (F5)
Available on the **Setup** page. Toggles between the displayed values. As default the Δ values for azimuth, horizontal distance and height are shown. If **MORE (F5)** is pressed, the display changes to the measured values of azimuth, horizontal distance and height.

PAGE (F6)
To change to another page on this screen.

Description of fields

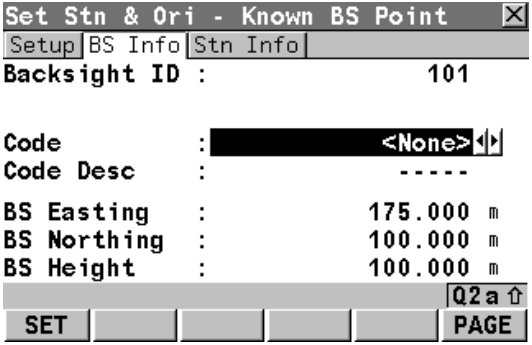
Field	Option	Description
<Backsight ID:>	Choicelist	Backsight point ID. All 3D and 2D points from **<Fixpoint Job:>** can be selected.
<Reflector Ht:>	User input	The default reflector height as defined in the active configuration set is suggested.
<Calc Azimuth:>	Output	Displays the calculated azimuth from the selected station to the backsight point.
<Calc HDist:>	Output	Displays the calculated horizontal distance between the selected station and backsight point.

Field	Option	Description
<ΔHoriz Dist:>	Output	The difference between the calculated horizontal distance from station to backsight point and the measured distance.
<ΔHeight:>	Output	The difference between the coordinate height of the backsight point and the measured height of the backsight point. If the backsight point is a 2D point, this field shows -----.
<Horiz Dist:>	Output	Displayed after a distance was measured with **DIST (F2)** and after **MORE (F5)** was pressed. The measured horizontal distance to the backsight point. Shows ----- before **DIST (F2)**.
<Height:>	Output	Displayed after a distance was measured with **DIST (F2)** and after **MORE (F5)** was pressed. The measured height of the backsight point. Shows ----- before **DIST (F2)**

Next step

IF	THEN
the next page is to be accessed	**PAGE (F6)** changes to the **BS Info** page.
the station and orientation is to be set	**SET (F1)** to set the station and orientation.

SETUP
Set Stn & Ori - Known BS Point, BS Info page



SET (F1)
To set the station and orientation and exit the Setup application program.

PAGE (F6)
To change to another page on this screen.

Description of fields

Field	Option	Description
<Backsight ID:>	Output	Backsight ID as entered in **SETUP Station Setup**.
<Code:>	Choicelist	The code for the backsight point.
<Code Desc:>	Output	A short description of the code.
<BS Easting:>	Output	The easting coordinate for the backsight point.
<BS Northing:>	Output	The northing coordinate for the backsight point.
<BS Height:>	Output	The height of the backsight point.

Next step

IF	THEN
the next page is to be accessed	**PAGE (F6)** changes to the **Stn Info** page.
the station and orientation is to be set	**SET (F1)** to set the station and orientation.

SETUP Set Stn & Ori - Known BS Point, Stn Info page

This screen has the same functionality as **SETUP Set Stn & Ori - Set Azimuth, Stn Info page**. Refer to "33.4.2 Set Azimuth" for further information. Refer to "8.5.3 Editing a Code" for further information on coding.

Next step

IF	THEN
the next page is to be accessed	**PAGE (F6)** changes to the **Setup** page.
the station and orientation is to be set	**SET (F1)** to set the station and orientation.

33.4.4 Orientation and Height Transfer

Requirements

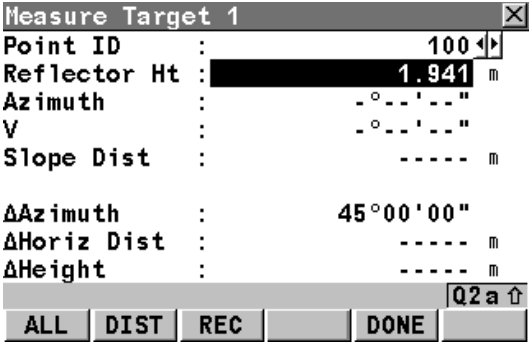
- The position coordinates of the station point are required. The instrument is set up and oriented to one or more known backsight targets.

Access step-by-step

Refer to the stated chapter for more information on screens.

Step	Description	Refer to chapter
1.	Press **ON** to access the **Programs** menu.	
2.	Select and activate **Setup** to move to the first screen.	
3.	Press **CONT (F1)** to access **SETUP Station Setup**.	
4.	**<Method:>** Ensure that **Ori & Ht Transfr** is selected. **<Station Coord:>** Select the source for the instrument station coordinates. **<Station ID:>** Enter/Select the instrument station. **<Instrument Ht:>** Enter the height of the instrument station. **<Fixpoint Job:>** Select the fixpoint job of the control/target points.	
5.	The geometric scale correction is displayed. The correction displayed depends upon the options chosen in **CONFIGURE TPS Corrections, GeoPPM** page: • if **<Calc Scale: Automatically>**, **<Computd Scale:>** is displayed. • if **<Calc Scale: Manually>**, **<Current Scale:>** is displayed.	16.4
6.	Press **CONT (F1)** to access **SETUP Measure Target**.	

SETUP
Measure Target



ALL (F1)
To measure and store the distances and angles made to the control points. After storing the measurement data to the **<Job:>**, the next **<Point ID:>** in the job is displayed. The instrument positions to the point if enough data is available.

DIST (F2)
To measure and display distances.

REC (F3)
Records displayed values to the current job. A distance measurement is not necessary before pressing **REC (F3)**. After storing the measurement data to the **<Job:>**, the next **<Point ID:>** in the job is displayed. The instrument positions to the point if enough data is available.

CALC (F5)
Available when sufficient data (when two or more points have been measured) is available for calculation. Runs the setup calculation and accesses **SETUP Results**.

SHIFT FIND (F2)
Available once sufficient data is available for calculation. Accesses **SETUP Find Target** to guide the reflector to the selected target point. Refer to "33.6 Finding a Target Point" for information on this screen.

SHIFT POSIT (F4)
Available once sufficient data is available for calculation. To position the instrument to the selected target point.

Description of fields

Field	Option	Description
<Point ID:>	Choicelist	The point ID of the target point to be measured. All points from **<Fixpoint Job:>** can be selected, except class **NONE**.
<Reflector Ht:>	User input	The default reflector height as defined in the active configuration set is suggested.
<Azimuth:>	Output	The current horizontal angle.
<V:>	Output	The current vertical angle.
<Slope Dist:>	Output	The measured slope distance after **DIST (F2)** was pressed.
<ΔAzimuth:>	Output	Displays the difference between the calculated azimuth and the current horizontal angle. If **<Method: Resection>,** displays ----- until sufficient data for calculation is available.
<ΔHoriz Dist:>	Output	The difference between the calculated and the measured horizontal distance.
<ΔHeight:>	Output	The difference between the given and the measured height of the target point.

Next steps

IF	THEN
more target points are to be measured	**ALL (F1)** to measure and store distances and angles, or **REC (F3)** to store the current measurement.
sufficient target points were measured	**CALC (F5)** to access **SETUP Results**. Refer to "33.5 Setup Results" for more information.

A maximum of ten target points can be measured and used for the calculation. When the maximum number of points was measured, the **SETUP Results** screen is accessed automatically after **ALL (F1)**. In the **SETUP Additional Information** screen measured target points can be deleted and the **SETUP Measure Target** screen can be reaccessed to measure new target points.

33.4.5 Resection/Resection Helmert

Requirements

The coordinates of the station point are unknown. The coordinates and orientation are determined by sighting to one or more known target points (maximum of ten target points). Only angles or both angles and distances may be measured. For a resection, least squares or robust calculations are used. For a resection Helmert, Helmert calculations are used.

Access step-by-step

Refer to the stated chapter for more information on screens.

Step	Description	Refer to chapter
1.	Press **ON** to access the **Programs** menu.	
2.	Select and activate **Setup** to move to the first screen.	
3.	Press **CONT (F1)** to access **SETUP Station Setup**.	
4.	**<Method:>** Select either **Resection** or **Resection Helmert**. **<Station ID:>** Enter the instrument station. **<Instrument Ht:>** Enter the height of the instrument station. **<Fixpoint Job:>** Select the fixpoint job of the control/target points.	
5.	Press **CONT (F1)** to access **SETUP Measure Target**.	
6.	**SETUP Measure Target**	33.4.4
7.	**ALL (F1)** or **REC (F3)**.	
8.	Refer to "33.4.4 Orientation and Height Transfer" for details on fields/keys.	

33.4.6 Local Resection

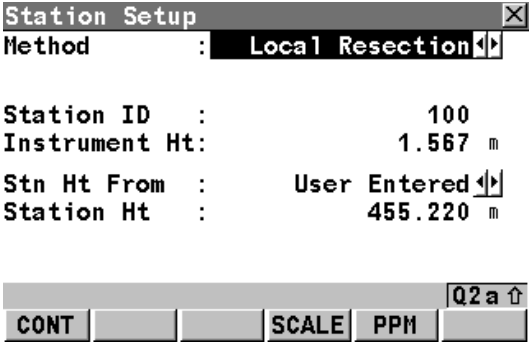
Description

- This method can be used to calculate the two or three-dimensional local coordinates for the instrument station and the orientation of the horizontal circle from distance and angular measurements to two target points.
- For Resection and/or Resection Helmert, refer to "33.4.5 Resection/Resection Helmert".

Access step-by-step

Step	Description
1.	Press **ON** to access the **Programs** menu.
2.	Select and activate **Setup** to move to the first screen.
3.	Press **CONT (F1)** to access **SETUP Station Setup**.
4.	**<Method:>** Ensure that **Local Resection** is selected. **<Station ID:>** Enter the instrument station. **<Instrument Ht:>** Enter the height of the instrument station. **<Stn Ht From:>** Select the source for the instrument station height. **<Station Ht:>** Enter the elevation of the instrument station.
5.	Press **CONT (F1)** to access **SETUP Measure Target**.

SETUP
Station Setup



CONT (F1)
To accept all settings and continue. The chosen settings are activated and the next screen **SETUP Measure Target** is displayed.

SCALE (F4)
To display the geometric corrections used with the measurements. Refer to "16.4 TPS Corrections".

PPM (F5)
To display the atmospheric corrections used with the measurements. Refer to "16.4 TPS Corrections".

SHIFT CONF (F2)
To configure the application program SETUP. The screen **SETUP Configuration** is displayed. Refer to "33.3 Configuring Setup".

SHIFT INDIV (F5) and **SHIFT RUN (F5)**
To change between successive numbering **<Station ID>** and individual numbering **<Indiv Pt ID>**. entering an individual backsight point ID different to the defined ID template and the running point ID according to the ID template. Refer to "15.1 ID Templates" for more information on point ID templates.

Description of fields

Field	Option	Description
<Method:>	Choicelist	**<Method: Local Resection>**
<Station ID:>	User input	The station ID of the instrument station.
<Instrument Ht:>	User input	Instrument height.
<Stn Ht From:>	**User Entered** or **Target 1 Ht Diff**	Only available when **<Method: Local Resection>**. For **<Stn Ht From: User Entered>** the height value of the station will be entered by the user and used to calculate the height of the measured points. For **<Stn Ht From: Target 1 Ht Diff>** the first measured point will be given Height=0 and the height of the station will be calculated relative to this point.
<Station Ht:>	Output	Only available when **<Stn Ht From: User Entered>**. The elevation of the instrument station.

Local resection step-by-step

The following table explains the most common settings. Refer to the stated chapter for more information on screens.

Step	Description	Refer to chapter
1.	**CONT (F1)** to access **SETUP Measure Target 1**.	
2.	**SETUP Measure Target 1** Choose a target point and type in a reflector height. Aim correctly at the reflector.	33.4.4
3.	**ALL (F1)** to record the measurement.	
4.	**SETUP Measure Target 2** Choose a target point and type in a reflector height. Aim correctly at the reflector.	33.4.4
5.	**ALL (F1)** to record the measurement and to access **SETUP Results**.	
6.	**SETUP Results, Stn Coords** page	33.5
7.	**SET (F1)** to store the selected setup data and exit the application program.	

33.5 Setup Results

33.5.1 Least Square and Robust Calculation

Description

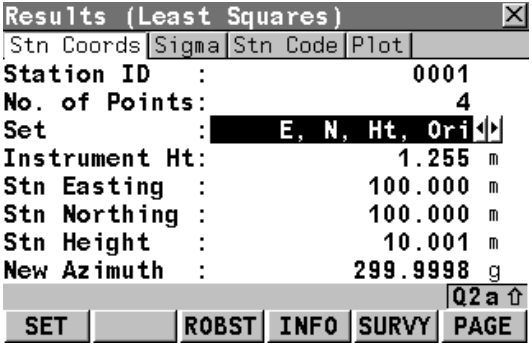
- This screen is displayed after a resection or orientation and height transfer calculation.
- For the calculations the least square or the robust method can be used. After the station is set, all following measurements will be related to this new station and orientation.

Access

Press **CALC (F5)** in the **SETUP Measure Target** screen.

SETUP Results, Stn Coords page

The screen described consists of the **Stn Coords**, **Sigma**, **Stn Code** and **Plot** page. The explanations for the softkeys given below are valid for the **Stn Coords** and **Sigma** page. Refer to "7.3.2 Creating a New Point" for information on the keys on the **Stn Code** page refer to "30.6 Plot Mode - MapView Screen Area" for information on the keys on the **Plot** page.



SET (F1)
To set data selected in **<Set:>** and to store all setup data and exit the application program.

ROBST (F3) or **LSQRS (F3)**
To display the results for the robust or the least squares calculation method.

INFO (F4)
To display additional information about the accuracy of the measured target points and to delete inconsistent measurements in the **SETUP Additional Information** screen.

DONE (F5) (Applicable to **Add Points Later**)
To temporarily exit the Setup program. The station setup will be incomplete but can be continued and completed at a later time.

SURVY (F5) (Applicable to **Meas All Now**)
To access **SETUP Measure Target** and to measure more target points.

PAGE (F6)
To change to another page on this screen.

SHIFT 3 PAR (F2) or **SHIFT 4 PAR (F2)**
Switches between a 3 parameter and 4 parameter helmert calculation. The results are immediately updated.

SHIFT OTHER (F5)
Available if two solutions were calculated. Changes between these solutions.

Description of fields

Field	Option	Description
<Station ID:>	User input	Station ID of the current station set up.
<No. of Points:>	Output	Number of points used in calculation.
<Set:>	Choicelist	The selected options are set and stored in the system. All other values are taken from the current system setup.
	E, N, Ht, Ori, **E, N, Ht** or **E, N, Ori**	Available for **<Method: Resection>** and **<Method: Resection Helmert>**.
	Ht,Ori, **Ht** or **Ori**	Available for **<Method: Ori & Ht Transfr>**.
<Instrument Ht:>	Output	The current instrument height.
<Stn Easting:>	Output	For **<Method: Ori & Ht Transfr>** Easting is displayed either from fixpoint job or system, as selected. For **<Method: Resection>** and **<Method: Resection Helmert>** the calculated Easting is displayed.
<Stn Northing:>	Output	For **<Method: Ori & Ht Transfr>** Northing is displayed either from fixpoint job or system, as selected. For **<Method: Resection>** and **<Method: Resection Helmert>** the calculated Northing is displayed.
<Stn Height:>	Output	The calculated Height is displayed.
<New Azimuth>	Output	New oriented azimuth with running angle as telescope moves.

Next step

PAGE (F6) changes to the **Sigma** page.

SETUP
Results,
Sigma page

Description of fields

Field	Option	Description
<σEasting:>	Output	Available for **<Method: Resection>** and **<Method: Resection Helmert>**. Standard deviation of the calculated station Easting.
<σNorthing:>	Output	Available for **<Method: Resection>** and **<Method: Resection Helmert>**. Standard deviation of the calculated station Northing.
<σ Height:>	Output	Standard deviation of the calculated station Height.
<Δ Height:>	Output	Delta height, the difference between original and calculated height.
<σ Hz Orient:>	Output	Standard deviation of the calculated orientation.
<Calc Scale:>	Output	Calculated scale factor from resection or orientation and height transfer.
<Calc ppm:>	Output	Available for **<Use Scale: Yes>**. ppm from calculated scale. ppm=(scale*1000000)-1.
<Current Scale:>	Output	The geometric scale correction is displayed. The correction displayed depends upon the options chosen in **CONFIGURE TPS Corrections, GeoPPM** page. Refer to "16.4 TPS Corrections" for details.

Next step
PAGE (F6) changes to the **Stn Code** page.

SETUP
Results,
Stn Code page

The functionality of the **Stn Code** page is similar to **MANAGE New Point, Code** page. Refer to "7.3.2 Creating a New Point" for more information on keys.

Description of fields

Field	Option	Description
<Point Code:>		The thematical code for the point.
	Choicelist	Available for **<Thematc Codes: With Codelist>**. All point codes from the job codelist can be selected. The attributes are shown as output, input or choicelist fields depending on their definition.
	User input	Available for **<Thematc Codes: Without Codelist>**. Codes can be typed in but not selected from a codelist. A check is performed to see if a point code of this name already exists in the job. If so, the according attributes are shown.
<Code Desc:>	Output	Available for **<Thematc Codes: With Codelist>**. The description of the code.
<Attribute n:>	User input	Available for **<Thematc Codes: Without Codelist>**. Up to eight attribute values are available.

Next step
PAGE (F6) changes to the **Plot** page.

33.5.2 Additional Information

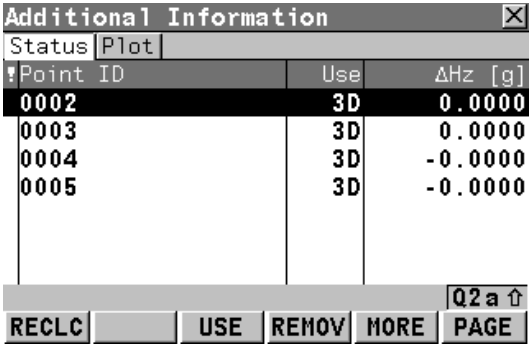
Description

- The **SETUP Additional Information** screen displays information about the accuracy of the measured target points and allows exclusion of measurements that are not to be used in the calculation.
- Additional measurements can be made and measurements can be deleted.

Access

Press **INFO (F4)** in the **SETUP Results** screen.

SETUP Additional Information, Status page



RECLC (F1)
To recalculate the station data and update all values after target points have been deleted or excluded from the calculation. Returns to the **SETUP Results** screen.

USE (F3)
To decide whether or not to use a target point in the calculation. Changes the value in the **Use** column.

REMOV (F4)
To delete a point from the list of measured target points and exclude it from the Setup calculation.

MORE (F5)
To change between displaying **ΔHz**, **ΔDist**t, **ΔHeight**, **ΔEast** and **ΔNorth** in the fourth column.

SHIFT SURVY (F5)
Accesses the **SETUP Measure Target** screen to measure more target points.

PAGE (F6)
To change to an other page on the screen. Refer to "30 MapView Interactive Display Feature" for more information.

Description of columns

Column	Description
!	The **!** indicates that the delta value of either measured horizontal angle, distance or height exceeds the calculation limit.
Point ID	The point ID of the measured target points.
Use	Indicates if and how a target point is used in the station calculation. Choices are **3D**, **2D, 1D** and **NO**.
ΔHz	Can be displayed by pressing **MORE (F5)**. Difference between calculated and measured horizontal angle for the target points. If a target point does not have coordinates, ----- are displayed. Differences exceeding the defined limit are indicated by a *.
ΔDist	Can be displayed by pressing **MORE (F5)**. Difference between calculated and measured distance from the station to the target points. If a target point does not have coordinates, ----- are displayed. Differences exceeding the defined limit are indicated by a *.
ΔHeight	Can be displayed by pressing **MORE (F5)**. Difference between calculated and measured height of the target points. If a target point does not have a height coordinate, ----- are displayed. Differences exceeding the defined limit are indicated by a *.

Column	Description
ΔEast	Can be displayed by pressing **MORE (F5)**. Difference between fixpoint and measured point, calculated from new station coordinates.
ΔNorth	Can be displayed by pressing **MORE (F5)**. Difference between fixpoint and measured point, calculated from new station coordinates.

Next step
PAGE (F6) changes to the **Plot** page.

SETUP Results, Plot page

Refer to "30.6 Plot Mode - MapView Screen Area" for details on the keys on the **Plot** page.

Next step
PAGE (F6) changes to the first page on this screen.

Next steps

IF	THEN
more target points are to be measured	**SHIFT SURVY (F5)** to access the **SETUP Measure Target** screen.
point measurements are to be accepted	**RECLC (F1)** to recalculate the station data and return to the **SETUP Results** screen.

33.5.3 Local Resection Calculation

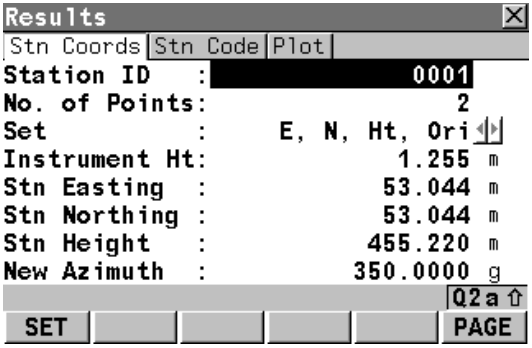
Description

- This screen is displayed after the local resection calculation.
- After the station is set, all following measurements will be related to this new station and orientation.

Access

Press **ALL (F1)** in the **SETUP Measure Target 2** screen.

SETUP Results, Stn Coords page



SET (F1)
To set data selected in **<Set:>** and to store all setup data and exit the application program.

PAGE (F6)
To change to an other page on the screen.

Description of fields

Field	Option	Description
<Station ID:>	User input	Station ID of the current station set up.
<No. of Points:>	Output	Number of points used in calculation.
<Set:>	Output	The displayed options are set and stored in the system. All other values are taken from the current system setup.
<Instrument Ht:>	Output	The current instrument height.
<Stn Easting:>	Output	The calculated Easting.
<Stn Northing:>	Output	The calculated Northing.
<Stn Height:>	Output	The calculated Height.
<New Azimuth>	Output	New oriented azimuth with running angle as telescope moves.

Next step

PAGE (F6) changes to the **Stn Code** page.

SETUP
Results,
Stn Code page

The functionality of the **Stn Code** page is similar to **MANAGE New Point, Code** page. Refer to "7.3.2 Creating a New Point" for more information on keys.

Description of fields

Field	Option	Description
<Point Code:>		The thematical code for the offset point.

Field	Option	Description
	Choicelist	Available for **<Thematc Codes: With Codelist>**. All point codes from the job codelist can be selected. The attributes are shown as output, input or choicelist fields depending on their definition.
	User input	Available for **<Thematc Codes: Without Codelist>**. Codes can be typed in but not selected from a codelist. A check is performed to see if a point code of this name already exists in the job. If so, the according attributes are shown.
<Code Desc:>	Output	Available for **<Thematc Codes: With Codelist>**. The description of the code.
<Attribute n:>	User input	Available for **<Thematc Codes: Without Codelist>**. Up to eight attribute values are available.

Next step
PAGE (F6) changes to the **Stn Plot** page.

SETUP Results, Stn Plot page

Refer to "30.6 Plot Mode - MapView Screen Area" for information on the keys on the **Plot** page.
Next step
PAGE (F6) changes to the first page on this screen.

33.6 Finding a Target Point

Description

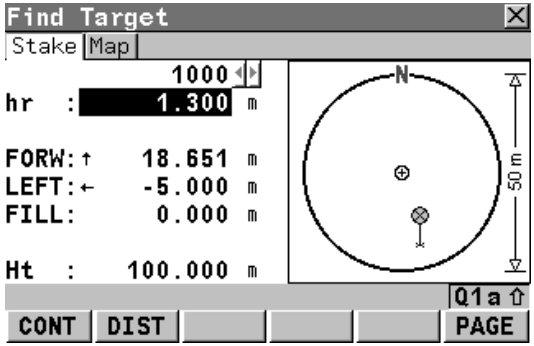
- The **SETUP Find Target** screen can be accessed, to guide the reflector to the selected target point.
- The screen is only available if the Stakeout application is available on the instrument.
- The functionality of this screen is similar to a stakeout routine and is intended to help find hidden survey bench marks or reference points.

Access

Press **SHIFT FIND (F2)** in **SETUP Measure Target** once enough data is available to roughly calculate the new orientation.

SETUP Find Target

This screen is shown with **<Stake Mode: Ortho from Stn>.** For graphics/symbols being displayed the settings are **<Symbols: From Station>** and **<Graphics: From Station>**. Refer to "34.4.1 Elements of the Graphical Display in the Stakeout" for information on elements of the graphic.



CONT (F1)
Exits **SETUP Find Target** and returns to **SETUP Measure Target**.

DIST (F2)
To measure and display distances. Updates all output fields in the screen.

Description of fields

Field	Option	Description
<Point ID:>	Output	The point ID of the target point to be measured.
<Reflector Ht:>/ <hr:>	Output	The default reflector height as defined in the active configuration set is suggested.
<Go FORWARD:>/ <FORW:> or **<Go BACWARD:>/ <BACK:>**	Output	The horizontal distance from the current reflector position to the target point along the line from the station to the current reflector position. Field is **<Go FORWARD:>** when the reflector has to be moved towards the instrument and **<Go BACKWARD:>** when the reflector has to be moved away from the instrument. Shows ----- before the first distance measurement with **DIST (F2)**.
<Go RIGHT:>/ <RGHT:> or **<Go LEFT:>/ <LEFT:>**	Output	Horizontal distance from the current reflector position to the target point orthogonal to the line from the station to the current reflector position. Field is **<Go RIGHT:>** when the target point is to the right of that line and **<Go LEFT:>** when the reflector is to the left of that line. Shows ----- before the first distance measurement with **DIST (F2)**.
<FILL:> or **<CUT:>**	Output	The height difference between the target point and the measured point. Field is **<CUT:>** when the measured point is higher than the target point and **<FILL:>** if the measured point is lower than the target point. Shows ----- before the first distance measurement with **DIST (F2)** or if the target point is a 2D point.

Field	Option	Description
<Height> or <Ht:>	Output	The measured height of the current position. Shows ----- before the first distance measurement with **DIST (F2)** or if the target point is a 2D point.

Next step
CONT (F1) to return to the **SETUP Measure Target** screen.

34 Stakeout

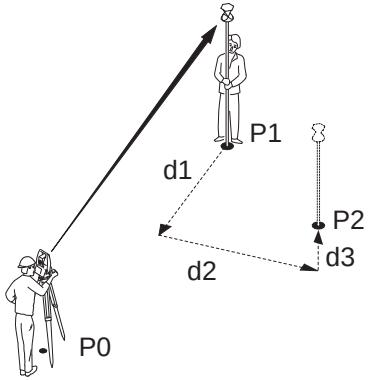
34.1 Overview

Description

The Stakeout application program is used to place marks in the field at predetermined points. These predetermined points are the points to be staked. The points to be staked may

- have been uploaded to a job on the instrument using Stonex® Tools.
- already exist in a job on the instrument.
- have been uploaded from an ASCII file to a job on the instrument using **Main Menu: Convert...\Import ASCII/GSI Data to Job**.
- be typed in.

Diagram



P0	Station
P1	Current position
P2	Point to be staked
d1	Stake out element
d2	Stake out element
d3	Stake out element

Stakeout modes

Points can be staked using different modes:

- Polar mode.
- Orthogonal mode.

The points to be staked must exist in a job on the active memory device or can be typed in.

Point types

It is possible to stake:

- Position only points.
- Height only points.
- Points with full sets of coordinates.

Height type

Height type of the point to be staked: Orthometric

Height source

Heights can be taken into account from the vertical component of a coordinate triplet.

Coding of staked points

Codes can be attached to staked points. Refer to "9 Coding" for information on coding. The behaviour of the coding functionality depends on the

- selected **<Stakeout Job:>** as the job with the points to be staked.
- selected **<Job:>** as the active job.
- definition of a display mask with input fields for coding and attributes.

IF <Stakeout Job:> and <Job:>	AND a display mask for point codes and attributes	THEN
are identical	is used	the point code and attributes attached to the point to be staked are suggested for the staked point. They can be changed.

IF <Stakeout Job:> and <Job:>	AND a display mask for point codes and attributes	THEN
are identical	is not used	the staked point is stored with the point code and attributes attached to the point to be staked.
are not identical	is used	**<Point Code: <None>>** is suggested. It can be changed and attributes can be entered. After a point has been stored with a code different to **<Point Code: <None>>** then the last used point code is suggested the next time.
are not identical	is not used	the staked point is stored with **<Point Code: <None>>**.

It may happen that the codes and/or attributes of the staked point and the point to be staked do not match. In this case, a screen opens where they can be corrected. Refer to "9.6 Code and Attribute Mismatch" for information on solving a code and/or attribute mismatch.

Properties of staked points

The properties stored with staked points are:

- Class: **MEAS**
- Sub class: **Stakeout**
- Source: **Stakeout**
- Instrument source: **TPS**

Averaging of staked points

The principles for averaging are identical to those of the Survey application program. Refer to "7.3.4 Mean Page" for information on averaging.

34.2 Accessing Stakeout

Access

Select **Main Menu: Programs...\Stakeout**.

OR

Press **ON**. Highlight **Stakeout**. **CONT (F1)**. Refer to "31.2 Accessing the Programs Menu" for information on the **ON** key.

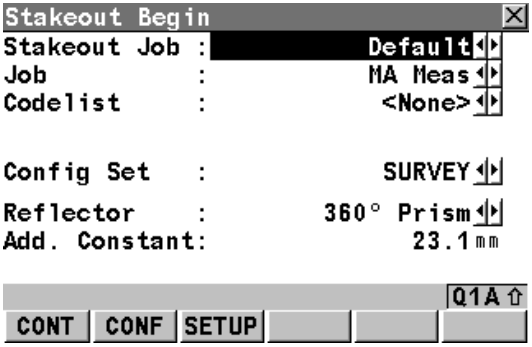
OR

Press **USER**. Refer to "2 USER Key" for information on the **USER** key.

OR

Press **STAKE (F5)** from another application program, for example COGO.

STAKEOUT
Stakeout Begin



CONT (F1)
To accept changes and access the subsequent screen. The chosen settings become active.

CONF (F2)
To configure Stakeout application program. Accesses **STAKEOUT Configuration**. Refer to "34.3 Configuring Stakeout".

SETUP (F3)
To set up station. Accesses **SETUP Station Setup**.

Description of fields

Field	Option	Description
<Stakeout Job:>	Choicelist	The job containing the points to be staked. All jobs from **Main Menu: Manage...\Jobs** can be selected.
<Job:>	Choicelist	The active job. All jobs from **Main Menu: Manage...\Jobs** can be selected. Points which are staked out are stored in this job. The original points to be staked are not copied to this job. The data from this job is shown in **MANAGE Data: Job Name**.
<Codelist:>	Choicelist	No codes are stored in the selected job. All codelists from **Main Menu: Manage...\Codelists** can be selected.
	Output	Codes have already been stored in the selected **<Job:>**. If codes had been copied from a System RAM codelist, then the name of the codelist is displayed. If codes have not been copied from a System RAM codelist but typed in, then the name of the active job is displayed.
<Config Set:>	Choicelist	The active configuration set. All configuration sets from **Main Menu: Manage...\Configuration Sets** can be selected.
<Reflector:>	Choicelist	The reflector currently set in the selected configuration set. All reflectors from **Main Menu: Manage...\Reflectors** can be selected.
<Add. Constant:>	Output	The additive constant stored with the chosen reflector.

Next step

IF the Stakeout application program	THEN
is to be accessed	**CONT (F1)** accepts the changes and accesses Stakeout application program. Refer to "34.4 Staking Out".
is to be configured	**CONF (F2)**. Refer to "34.3 Configuring Stakeout".

34.3 Configuring Stakeout

Access

Select **Main Menu: Programs...\Stakeout**. In **STAKEOUT Stakeout Begin** press **CONF (F2)** to access **STAKEOUT Configuration**.

OR

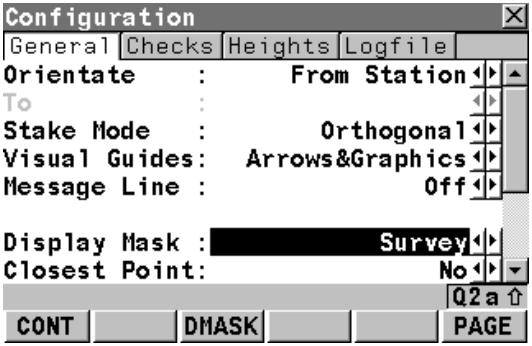
Press **ON**. Highlight **Stakeout**. **CONT (F1)**. In **STAKEOUT Stakeout Begin** press **CONF (F2)** to access **STAKEOUT Configuration**.

OR

Press **SHIFT CONF (F2)** in **STAKEOUT XX Stakeout**.

STAKEOUT Configuration, General page

This screen consists of the **General** page, the **Checks** page, the **Heights** page and the **Logfile** page. The explanations for the softkeys given below are valid for all pages, unless otherwise stated.



CONT (F1)
To accept changes and return to the screen from where this screen was accessed.

DMASK (F3)
Accesses **CONFIGURE Define Display Mask n**. Available for **<Display Mask:>** being highlighted on **General** page. Refer to "15.2 Display Settings".

PAGE (F6)
To change to another page on this screen.

SHIFT ABOUT (F5)
To display information about the program name, the version number, the date of the version, the copyright and the article number.

Description of fields

Field	Option	Description
<Orientate:>		The reference direction to be used to stakeout points. The stakeout elements and the graphical display shown in the Stakeout application program are based on this selection.
	From Station	The direction of the orientation is from the instrument to the point to be staked.
	To Station	The direction of the orientation is from the point to be staked to the instrument.
	From North	The direction of the orientation is from the North direction to the point to be staked.
	To North	The direction of the orientation is from the point to be staked to the North direction.
	To Arrow	The direction of the orientation is from the current position to the point to be staked. The graphical display shows an arrow pointing in the direction of the point to be staked.
	To Last Point	Timewise the last recorded point. If no points are yet staked, **<Orientate: To North>** is used for the first point to be staked.
	To Point(Stake)	A point from **<Stakeout Job:>** selected in **STAKEOUT Stakeout Begin**.

Field	Option	Description
	To Point(Store)	A point from **<Job:>** selected in **STAKEOUT Stakeout Begin**.
	To Line(Stake)	The direction of the orientation is parallel to a reference line from **<Stakeout Job:>** selected in **STAKEOUT Stakeout Begin**. Open the listbox to create, edit or delete a reference line.
	To Line(Store)	The direction of the orientation is parallel to a reference line from **<Job:>** selected in **STAKEOUT Stakeout Begin**. Open the listbox to create, edit or delete a reference line.
<To:>	Choicelist	Available for **<Orientate: To Point(Stake)>**, **<Orientate: To Point(Store)>**, **<Orientate: To Line(Stake)>** and **<Orientate: To Line(Store)>**. To select the point or line to be used for orientation. Refer to "7.2 Accessing Data Management" for information on creating, editing and deleting a known point.
<Stake Mode:>		The method of staking out.
	Polar	The direction from the orientation reference, the horizontal distance and the cut/fill is displayed.
	Orthogonal	The distance forwards to/backwards from the point, the distance right/left to the point and the cut/fill is displayed.
<Visual Guides:>		Arrows and/or a graphical display in **STAKEOUT XX Stakeout**. help finding the point to be staked.

Field	Option	Description
	Off	Neither arrows nor a graphical display are shown.
	Arrows	Upon pressing **DIST (F2)** arrows are shown.
	Graphics	A graphical display is shown. Refer to "34.4.1 Elements of the Graphical Display in the Stakeout"..
	Arrows&Graphics	Upon pressing **DIST (F2)** arrows are shown. A graphical display is always shown.
<Message Line:>		For each point which is selected for staking, angle and distance information is momentarily displayed in the message line.
	Off	No information is displayed in the message line.
	Dist From Stn	The delta Hz angle that the instrument should turn to the point and the distance from the instrument to the point is momentarily displayed in the message line.
	Dist Frm Last Pt	The delta Hz angle that the instrument should turn to the point and the distance from the last staked point is momentarily displayed in the message line.
<Display Mask:>	Choicelist	The user defined display mask to be shown in **STAKEOUT XX Stakeout**. All display masks of the active configuration set defined in **CONFIGURE Display Settings** can be selected.
<Closest Point:>		The order of the points suggested for staking out.

Field	Option	Description
	Yes	After staking and storing a point, the next point suggested for staking out is the point closest to the point which was staked. If there are many points in **<Stakeout Job:>**, the search may take a few seconds.
	No	After staking and storing one point, the next point suggested for staking out is the subsequent one in **<Stakeout Job:>**.
<Auto Position:>	**2D**	Instrument positions horizontally to the point to be staked.
	3D	Instrument positions horizontally and vertically to the point to be staked.
	Off	Instrument does not position to the point to be staked.
<Update Angle:>	**Yes**	Angles are updated with telescope movement after a distance was measured.
	No	Angles and stakeout values are updated after a distance measurement. Then all values are frozen until the next distance is taken. When **<Automation: Robotic:>** and locked to a target the values do not change.
<Store Pt ID:>	**Same as Stake Pt**	The manually occupied staked points are stored with the same point ID's as the points to be staked.
	Prefix	Adds the setting for **<Prefix/Suffix:>** in front of the original point ID's.

Field	Option	Description
	Suffix	Adds the setting for **<Prefix/Suffix:>** at the end of the original point ID's.
<Prefix/Suffix:>	User input	Available for **<Store Pt ID: Prefix>** and **<Store Pt ID: Suffix>**. The identifier with up to four characters is added in front of or at the end of the ID of the manually occupied staked point.

Next step

PAGE (F6) changes to the **Checks** page. Refer to paragraph "STAKEOUT Configuration, Checks page".

STAKEOUT Configuration, Checks page

Description of fields

Field	Option	Description
<Pos Check:>	**Yes** or **No**	Allows a check to be made on the horizontal coordinate difference between the staked point and the point to be staked. If the defined **<Pos Limit:>** is exceeded, the stakeout can be repeated, skipped or stored.
<Pos Limit:>	User input	Available for **<Pos Check: Yes>**. Sets the maximum horizontal coordinate difference accepted in the position check.
<Height Check:>	**Yes** or **No**	Allows a check to be made on the vertical difference between the staked point and the point to be staked. If the defined **<Height Limit:>** is exceeded, the stakeout can be repeated, skipped or stored.
<Height Limit:>	User input	Available for **<Height Check: Yes>**. Sets the maximum vertical difference accepted in the height check.
<Beep near Pt:>	**Yes** or **No**	The instrument beeps when the horizontal radial distance from the current position to the point to be staked is equal to or less than defined in **<Dist from Pt:>**.
<Dist from Pt:>	User input	Available for **<Beep near Pt: Yes>**. The horizontal radial distance from the current position to the point to be staked when a beep should be heard.

Next step

PAGE (F6) changes to the **Heights** page. Refer to paragraph "STAKEOUT Configuration, Heights page".

STAKEOUT Configuration, Heights page

Description of fields

Field	Option	Description
<Height Offset:>	User input	Allows a constant height offset to be applied to the height of the points.
<Edit Height:>	**Yes**	The field **<D Ht:>** for the design height is displayed in **STAKEOUT Orthogonal Stakeout**, **Stake** page and **STAKEOUT Polar Stakeout**, **Stake** page. The design height is the height of the point to be staked. The value for **<D Ht:>** can be changed.
	No	The field **<Ht:>** for the height of the current position is displayed in **STAKEOUT Orthogonal Stakeout**, **Stake** page and **STAKEOUT Polar Stakeout**, **Stake** page. The value for **<Ht:>** cannot be changed.

Next step

PAGE (F6) changes to the **Logfile** page. Refer to paragraph "STAKEOUT Configuration, Logfile page".

STAKEOUT Configuration, Logfile page

Description of fields

Field	Option	Description
<Write Logfile:>	**Yes** or **No**	To generate a logfile when the application program is exited. A logfile is a file to which data from an application program is written to. It is generated using the selected **<Format File:>**.
<File Name:>	Choicelist	Available for **<Write Logfile: Yes>**. The name of the file to which the data should be written. A logfile is stored in the \DATA directory of the active memory device. The data is always appended to the file. Opening the choicelist accesses **XX Logfiles** where a name for a new logfile can be created and an existing logfile can be selected or deleted.
<Format File:>	Choicelist	Available for **<Write Logfile: Yes>**. A format file defines which and how data is written to a logfile. Format files are created using Stonex® Tools. A format file must first be transferred from the CompactFlash card to the System RAM before it can be selected. Refer to "22 Tools...\Transfer Objects..." for information on how to transfer a format file. Opening the choicelist accesses **XX Format Files** where an existing format file can be selected or deleted.

Next step
PAGE (F6) changes to the first page on this screen.

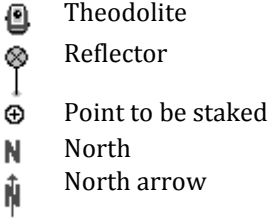
34.4 Staking Out

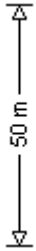
34.4.1 Elements of the Graphical Display in the Stakeout

Description

A graphical display provides a guide to find the point to be staked out. The elements of the graphical display used within the Stakeout application program screens are explained in this chapter. Some of the elements depend on the selection for **<Visual Guides:>** in **STAKEOUT Configuration**, **General** page. Other elements are commonly displayed.
The **Map** page provides an interactive display of the data. Refer to "30.5 Map Mode" for information on the functionality and softkeys available.

Elements of graphical display



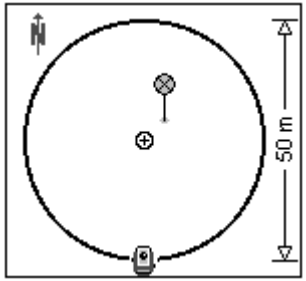


For **<Visual Guides: Off>** no graphical display is shown on the screen.

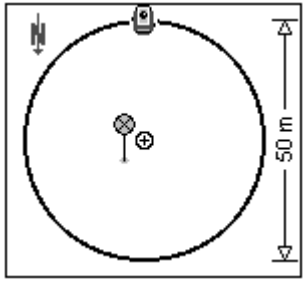
Graphical display

For scale >1000 m the circle is displayed in grey.

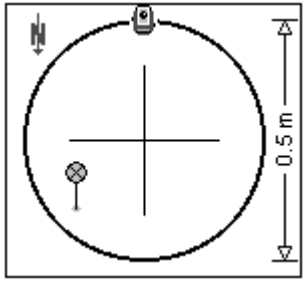
From Station or North



To Station or North



For scale 0.5 m



34.4.2 Manual Entry of Points to be Staked

Description

Manual entry of points to be staked can be used to input angle and distance values.

It is possible to type in angles and distances independent of the used **<Stake Mode:>**.

Manual entry of points step-by-step

The following table explains the most common settings. Refer to the stated chapter for more information on screens.

Step	Description	Refer to chapter
1.	Set up and orient the instrument.	33
2.	Start the Stakeout application program.	
3.	**STAKEOUT Stakeout Begin** Check the settings.	
4.	**CONT (F1)** to access **STAKEOUT XX Stakeout**.	34.4
5.	**STAKEOUT XX Stakeout** **SHIFT MSTAK (F3)** to access **STAKEOUT Manual Entry**.	
6.	**STAKEOUT Manual Entry** Enter the values of the point to be staked.	
7.	**STAKE (F1)** to access **STAKEOUT XX Stakeout**.	
	The point is created and the coordinates of the point are remembered allowing the point to be staked out.	
8.	**STAKEOUT XX Stakeout**	

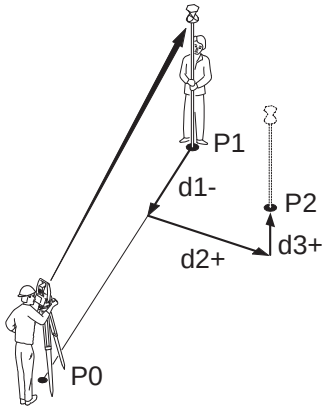
Step	Description	Refer to chapter
	Check the reflector height.	
9.	Continue with step 9. from paragraph "Stake out in orthogonal from station mode step-by-step".	

34.4.3 Staking Out in Orthogonal Mode

Description

Points can be staked out using orthogonal values to guide to the point to be staked. Values are relative to the line defined by station and current position. The stakeout elements are a horizontal distance forwards/backwards, a horizontal distance right/left and a cut/fill. The values are calculated between the current position and the point to be staked. The values are calculated either from the station to the point or from the point to the station depending on the setting of **<Stake Mode:>**.

Orthogonal from and to station



P0	Station
P1	Current position
P2	Point to be staked
d1	**<Go FORWARD:>** ↓ ↑ or **<Go BACK:>** ↑ ↓
d2	**<Go RIGHT:>** → or **<Go LEFT:>** ←
d3	**<CUT:>** or **<FILL:>**

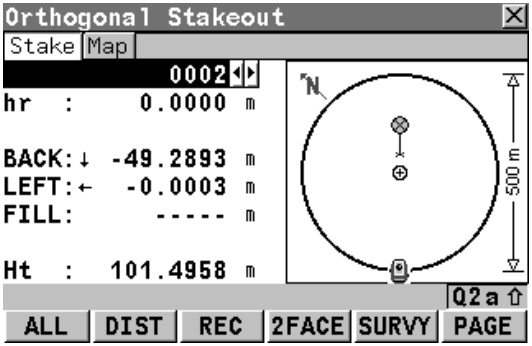
☞ **<Stake Mode: Ortho from Stn>** is configured in **STAKEOUT Configuration**, **General** page. Refer to "34.3 Configuring Stakeout".

Access

Refer to "34.2 Accessing Stakeout" to access **STAKEOUT Orthogonal Stakeout**.

STAKEOUT
Orthogonal Stakeout, Stake page

The pages shown are those from a typical configuration set. An additional page is available when a user defined display mask is used.



ALL (F1)
To measure a distance and store distance and angles.

DIST (F2)
To measure a distance.

REC (F3)
To store angles and distance. Distance must be measured before.

2FACE (F4)
To take a measurement in Face I and Face II. The point stored is an average of the two measurements.
When using instruments fitted with iLock, the point is automatically measured in both faces, the resulting point is stored and the instrument is returned to the first face.
This hotkey is only available for <**EDM Mode**: **Standard**> and <**EDM Mode**: **Fast**> and in the Survey and Stakeout programs.

SURVY (F5)
To access Survey application program to measure points independent from the Stakeout application program. To return to Stakeout application program, press **SHIFT QUIT (F6)** or **ESC**.

PAGE (F6)
To change to another page on this screen.

SHIFT CONF (F2)
To configure stakeout. Refer to "34.3 Configuring Stakeout".

SHIFT POS2D (F3)
To position the telescope (X,Y) onto the point to be staked.

SHIFT POS3D (F4)
To position the telescope (X,Y,Z) onto the point to be staked.

SHIFT MSTAK (F5)
To enter angle and distance values to stake out a point. Refer to "34.4.2 Manual Entry of Points to be Staked".

Description of fields

Field	Option	Description
<Point ID:>	Choicelist	The point ID of the point to be staked. Accesses **STAKEOUT Data: Job Name** where points are shown according to sort and filter settings and staked points are indicated by ⚑.
<Reflector Ht:> or **<hr:>**	User input	The default reflector height as defined in the active configuration set is suggested.
<Go FORWARD:> or **<FORW:>**	Output	The horizontal distance along the line defined by station and reflector from the current position to the point to be staked. ↓ or ↑ to move towards the station depending on **<Symbols:>**.

Field	Option	Description
<Go BACK:> or **<BACK:>**	Output	The horizontal distance in reverse direction from the line defined by station and reflector from the current position to the point to be staked. ↑ or ↓ to move away from the station depending on **<Symbols:>**.
<Go RIGHT:> or **<RGHT:>**	Output	The direction depends on **<Stake Mode:>**. The horizontal distance orthogonal to the right of the line defined by station and reflector from the current position to the point to be staked. → to move to the right of the line defined in **<Symbols:>**, ← to move to the left of the line defined in **<Symbols:>**.
<Go LEFT:> or **<LEFT:>**	Output	The direction depends on **<Stake Mode:>**. The horizontal distance from the current position to the point to be staked orthogonal to the left of the line defined by station and reflector. ← to move to the left of the line defined in **<Symbols:>**, → to move to the right of the line defined in **<Symbols:>**.
<CUT:>	Output	The negative height difference from the height of the current position to the height of the point to be staked. The value for **<Height Offset:>** configured in **STAKEOUT Configuration**, **Heights** page is taken into account. Move down.

Field	Option	Description
<FILL:>	Output	The positive height difference from the height of the current position to the height of the point to be staked. The value for **<Height Offset:>** configured in **STAKEOUT Configuration**, **Heights** page is taken into account. Move up.
<Height:> or **<Ht:>**	Output	Available for **<Edit Height: No>** in **STAKEOUT Configuration**, **Heights** page. The height of the current position is displayed as orthometric height. The value for **<Height Offset:>** configured in **STAKEOUT Configuration**, **Heights** page is taken into account.
<Design Ht:> or **<D Ht:>**	User input	Available for **<Edit Height: Yes>** in **STAKEOUT Configuration**, **Heights** page. The design height, which is the height of the point to be staked, is displayed as orthometric height. The value for **<Height Offset:>** configured in **STAKEOUT Configuration**, **Heights** page is not taken into account. Changing the value for **<D Ht:>** changes the values displayed for **<CUT:>** and **<FILL:>**.

Next step

PAGE (F6) changes to the **Map** page. Refer to paragraph "STAKEOUT Orthogonal Stakeout, Map page".

STAKEOUT Orthogonal Stakeout, Map page

The **Map** page provides an interactive display of the data. Refer to "30 MapView Interactive Display Feature" for information on the functionality and softkeys available.

Next step

PAGE (F6) changes to the first page on this screen.

Stake out in orthogonal from station mode step-by-step

The following table explains the most common settings. Refer to the stated chapter for more information on screens.

Step	Description	Refer to chapter
1.	Set up and orient the instrument.	33
☞	**<Automation: Robotic>** and **<EDM Mode: Tracking>** are configured in **CONFIGURE EDM & iLock Settings**.	16.1
2.	Start the Stakeout application program.	34.2
3.	**STAKEOUT Stakeout Begin** Check the settings.	34.2
4.	**CONF (F2)** to access **STAKEOUT Configuration, General** page.	
5.	**STAKEOUT Configuration**, **General** page **<Orientate: From Station>** **<Stake Mode: Orthogonal>**	34.3
☞	This step-by-step instruction uses typical settings in all other fields on all pages in **STAKEOUT Configuration**.	34.3
6.	**CONT (F1)** to access **STAKEOUT Stakeout Begin**.	

Step	Description	Refer to chapter
7.	**CONT (F1)** to access **STAKEOUT Orthogonal Stakeout**.	
8.	**STAKEOUT Orthogonal Stakeout**, **Stake** page Check the suggested point ID and the reflector height.	
9.	**DIST (F2)**.	
10.	Move to the point to be staked either by following the range information in the fields **<FORW:>**, **<BACK:>**, **<RGHT:>** and **<LEFT:>** or the graphical display.	
☞	When the value is at or nearly zero, the current position is the point to be staked.	
11.	Hold the reflector steady over the marker.	
12.	**REC (F1)** stores distance and angles.	
☞	For **<Pos Check: Yes>** and/or **<Height Check: Yes>** in **STAKEOUT Configuration**, **Checks** page, a check is made on the horizontal and/or vertical coordinate distance from the staked point to the point to be staked. If either of the configured difference limits are exceeded, **STAKEOUT Difference Limit Exceeded** is accessed.	34.4.5
13.	Are more points to be staked? • If **yes**, continue with step 14. • If **no**, continue with step 16.	
14.	**STAKEOUT Orthogonal Stakeout**, **Stake** page	

Step	Description	Refer to chapter
	According to sort and filter settings, the subsequent point in **<Stakeout Job:>** is suggested for staking out.	
15.	Repeat steps 8. to 13.	
16.	**SHIFT QUIT (F6)** to return to the screen from where **STAKEOUT Stakeout Begin** was accessed.	

Stake out in orthogonal to station mode step-by-step

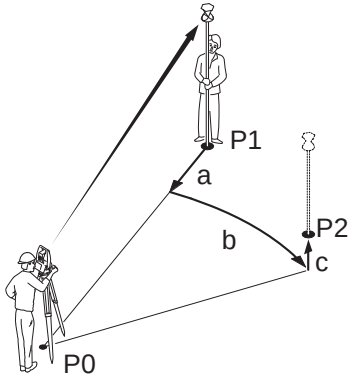
The steps are identical to those of staking out in orthogonal from station mode. Follow the instructions in paragraph "Stake out in orthogonal from station mode step-by-step" using **<Orientate: To Station>** and **<Stake Mode: Orthogonal>**. The values are calculated from the point to the station.

34.4.4 Staking Out in Polar Mode

Description

The stakeout elements are a direction from the station, a horizontal distance and a cut/fill. The range information is calculated from the current position to the point to be staked in reference to the station.

Diagram



P0	Station
P1	Current position
P2	Point to be staked
a	**<Δ DISTANCE:>**
b	**<Δ HZ:>**
c	**<CUT:>** or **<FILL:>**

<Stake Mode: Polar> is configured in **STAKEOUT Configuration**, **General** page. Refer to "34.3 Configuring Stakeout".

Access

Refer to "34.2 Accessing Stakeout" to access **STAKEOUT Polar Stakeout**.

STAKEOUT Polar Stakeout, Stake page

The pages shown are those from a typical configuration set. An additional page is available when a user defined display mask is used.
The keys are identical with those in **STAKEOUT Orthogonal Stakeout**, **Stake** page. Refer to "34.4.3 Staking Out in Orthogonal Mode" for information on the keys.

Description of fields

Field	Option	Description
<Point ID:>	Choicelist	The point ID of the point to be staked. Accesses **STAKEOUT Data: Job Name** where points are shown according to sort and filter settings and staked points are indicated by ⚑.
<Reflector Ht:> or **<hr:>**	User input	The default reflector height as defined in the active configuration set is suggested.
<Δ HZ:>	Output	The difference of the horizontal angle from the point to be staked to the current position. ☞ For **<Orientate: From Station>** and **<Orientate: To Station>** the value is calculated and displayed permanently. For other orientation methods, the distance must be measured before the value can be displayed.
<Δ DISTANCE:> or **<Δ D:>**	Output	The difference of the horizontal distance from the point to be staked to the current position along the line defined by current position and station.
<CUT:>	Output	The negative height difference from the height of the current position to the height of the point to be staked. The value for **<Height Offset:>** configured in **STAKEOUT Configuration**, **Heights** page is taken into account. Move down.

Field	Option	Description
<FILL:>	Output	The positive height difference from the height of the current position to the height of the point to be staked. The value for **<Height Offset:>** configured in **STAKEOUT Configuration**, **Heights** page is taken into account. Move up.
<Height:> or **<Ht:>**	Output	Available for **<Edit Height: No>** in **STAKEOUT Configuration**, **Heights** page. The height of the current position is displayed as orthometric height. The value for **<Height Offset:>** configured in **STAKEOUT Configuration**, **Heights** page is taken into account.
<Design Ht:> or **<D Ht:>**	User input	Available for **<Edit Height: Yes>** in **STAKEOUT Configuration**, **Heights** page. The design height, which is the height of the point to be staked, is displayed as orthometric height. The value for **<Height Offset:>** configured in **STAKEOUT Configuration**, **Heights** page is not taken into account. Changing the value for **<D Ht:>** changes the values displayed for **<CUT:>** and **<FILL:>**.

Next step

PAGE (F6) changes to the **Map** page. Refer to paragraph "STAKEOUT Orthogonal Stakeout, Map page".

STAKEOUT
Polar Stakeout, Map page

The **Map** page provides an interactive display of the data. Refer to "30 MapView Interactive Display Feature" for information on the functionality and softkeys available.

Next step
PAGE (F6) changes to the first page on this screen.

Stake out in polar mode step-by-step

The steps are identical to those of staking out in orthogonal mode. Refer to "34.4.3 Staking Out in Orthogonal Mode". Follow the instructions in paragraph "Stake out in orthogonal from station mode step-by-step" using **<Stake Mode: Polar>**. The values are displayed as **<Δ HZ:>** and **<Δ DISTANCE:>**.

34.4.5 Stakeout Difference Limit Exceeded

Description

If configured a check is made on the horizontal and/or vertical coordinate distance from the staked point to the point to be staked when storing a staked point. Refer to "34.3 Configuring Stakeout" for information on configuring the check and the limits.

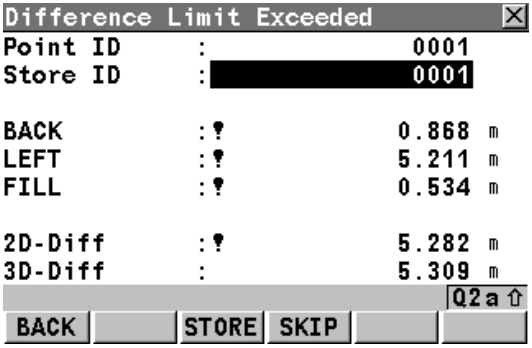
Access

The screen shown below is accessed automatically when the staked point is stored if either of the configured difference limits are exceeded.

STAKEOUT Difference Limit Exceeded

The availability of the fields depends on the configured **<Stake Mode:>**.

The limits that have been exceeded are shown in bold and indicated by a !.



BACK (F1)
To return to **STAKEOUT XX Stakeout** without storing the point. Staking out of the same point continues.

STORE (F3)
To accept the coordinate differences, store the point information and return to **STAKEOUT XX Stakeout**.

SKIP (F4)
To return to **STAKEOUT XX Stakeout** without storing the point. According to filter and sort settings the subsequent point in **<Stakeout Job:>** is suggested for staking out.

Description of fields

Field	Option	Description
<Point ID:>	Output	The point ID of the point to be staked.
<Store ID:>	User input	The unique number which is used to store the staked point. Allows a different point ID to be typed in if needed.
<Δ EASTING:>	Output	The difference of the Easting coordinate between the the point to be staked and the current position.
<Δ NORTHING:>	Output	The difference of the Northing coordinate between the point to be staked and the current position.
<Δ HZ:>	Output	The difference of the horizontal angle to the point to be staked and the current position.
<Δ DISTANCE:>	Output	The difference of the horizontal distance to the point to be staked and the current position.
<FORWARD:>	Output	The horizontal distance from the current position to the point to be staked along the line defined by station and reflector.
<BACK:>	Output	The horizontal distance from the current position to the point to be staked in the reverse direction of the line defined by station and reflector.
<RIGHT:>	Output	Horizontal distance from the current position to the point to be staked orthogonal to the right of the line defined by station and reflector.

Field	Option	Description
<LEFT:>	Output	Horizontal distance from the current position to the point to be staked orthogonal to the left of the line defined by station and reflector.
<CUT:>	Output	The negative height difference from the height of the staked point to the height of the point to be staked.
<FILL:>	Output	The positive height difference from the height of the staked point to the height of the point to be staked.
<2D-Diff:>	Output	Displays the horizontal difference from the staked point to the point to be staked.
<3D-Diff:>	Output	Displays the spatial difference from the staked point to the point to be staked.

Next step

IF the exceeded difference limit	THEN
is not to be accepted	**BACK (F1)** to stake the same point again.
is to be accepted	**STORE (F3)** to store the point and to stake out the next point.
is not to be accepted but cannot be improved	**SKIP (F4)** to skip staking this point and to stake out the next point.

35 Survey - General

35.1 Accessing Survey

Access

Select **Main Menu: Survey**.

OR

Select **Main Menu: Programs...\Survey**

OR

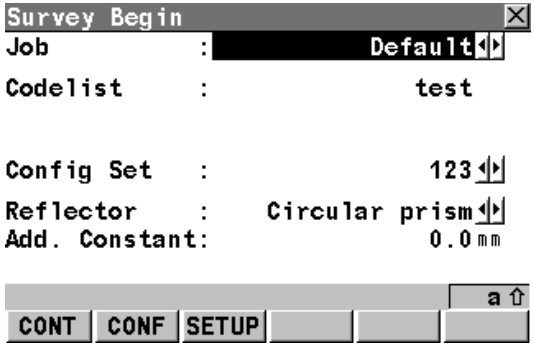
Press **USER**. Refer to "2 USER Key" for information on the **USER** key.

OR

Press **ON**. Highlight **Survey**. **CONT (F1)**.

Refer to "31.2 Accessing the Programs Menu" for details on the **ON** key.

SURVEY
Survey Begin



CONT (F1)
To accept changes and access the subsequent screen. The chosen settings become active.

CONF (F2)
To configure SmartCodes, auto points and remote point measurements. Accesses **SURVEY Configuration**. Refer to "36 Survey - Auto Points" and to "37 Survey - Remote Point" for information on the fields and keys.

SETUP (F3)
To set up station. Accesses **SETUP Station Setup**.

Description of fields

Field	Option	Description
<Job:>	Choicelist	The active job. All jobs from **Main Menu: Manage...\Jobs** can be selected.
<Codelist:>	Choicelist	No codes are stored in the selected job. All codelists from **Main Menu: Manage...\Codelists** can be selected.
	Output	Codes have already been stored in the selected **<Job:>**. If codes had been copied from a System RAM codelist, then the name of the codelist is displayed. If codes have not been copied from a System RAM codelist but typed in, then the name of the active job is displayed.
<Config Set:>	Choicelist	The active configuration set. All configuration sets from **Main Menu: Manage...\Configuration Sets** can be selected.
<Reflector:>	Choicelist	The active reflector. All reflectors from **Main Menu: Manage...\Reflectors** can be selected.
<Add. Constant:>	Output	The additive constant stored with the chosen reflector.

Next step

CONT (F1) to access **SURVEY Survey: Job Name**, where measurements can be performed with **ALL (F1)** or **DIST (F2)** and/or **REC (F3)**.

35.2 Surveying Points

Description

The Survey application program is used for point measurement. Coordinates for points can be measured and stored using **ALL (F1)**, **DIST (F2)** and **REC (F3)**.

Access step-by-step

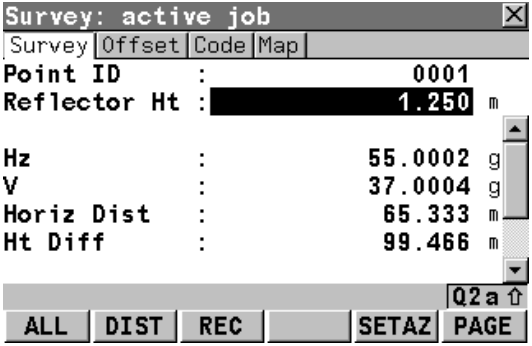
The table describes the main access to **SURVEY Survey: Job Name**.
Access is possible from other screens where individual point measurements are needed, for example from **COGO Inverse** with **SURVY (F5)**.

Step	Description
1.	Refer to "35.1 Accessing Survey" to access **SURVEY Survey Begin**.
2.	**SURVEY Survey Begin** **CONT (F1)** to access **SURVEY Survey: Job Name**.

SURVEY Survey: Job Name, Survey page

The fields shown are those from a typical configuration set.The screen described consists of the **Survey** page and the **Map** page. The explanations for the softkeys given below are valid for the **Survey** page. Refer to "30 MapView Interactive Display Feature" for information on the keys on the **Map** page.

The fields and functionality of this screen vary slightly when accessed from other application programs where individual point measurements are needed.



ALL (F1)
To measure and store distances and angles.

STOP (F1)
Available if **<EDM Mode: Tracking>** and **DIST (F2)** was pressed. Stops the distance measurements. **(F1)** changes back to **ALL**.

DIST (F2)
To measure and display distances. Available unless **<EDM Mode: Tracking>** and/or **<Log Auto Pts: Yes>**, after the tracking or logging is started.

REC (F3)
To record data.
If **<EDM Mode: Tracking>** and/or **<Log Auto Pts: Yes>**, records measured point and continues tracking.

REMOT (F4)
Available if **<Use Remote Pt: Yes>** is set in the **SURVEY Configuration, Remote Pt** page. To access **SURVEY Survey Remote Point**.

SETAZ (F5)
To access the **SETUP Set Stn & Ori - Set Azimuth** screen to set the horizontal angle. Refer to "33.4.2 Set Azimuth" for information on the **SURVEY Set Stn & Ori - Set Azimuth** screen.

TEST (F5)
To access the **SURVEY EDM Test Signal/Frequency** screen. Available for **<EDM Mode: Tracking>** and/or **<Log Auto Pts: Yes>**, after the tracking or logging is started.

SHIFT CONF (F2)

To configure auto points and remote point measurements. Accesses **SURVEY Configuration**. When **SHIFT AVGE (F2)** or **SHIFT ABS (F2)** are active, this key is not available. Refer to "36 Survey - Auto Points" and to "37 Survey - Remote Point" for information on the fields and keys.

SHIFT AVGE (F2)

To check the residuals for the averaged point. Available for **<Averaging Mode: Average>** and for more than one measured coordinate triplet recorded for the same point. Refer to "7.3.4 Mean Page".

SHIFT ABS (F2)

To check the absolute difference between the measurements. Available for **<Averaging Mode: Absolute Diffs>** and for more than one measured coordinate triplet recorded for the same point. Refer to "7.3.4 Mean Page".

SHIFT 2FRec (F3)

To aim manually at the target and only record the angle measurement (Hz/V) in Face I and Face II. The point stored is an average of the two measurements.

This hotkey is only available in the Survey program for **<EDM Type: Reflector (RL)>** or **<EDM Type: Reflctrless (IR)>** if **<Automation: None>**.

SHIFT 2FAll (F4)

To take a measurement in Face I and Face II. The point stored is an average of the two measurements.

When using instruments fitted with iLock, the point is automatically measured in both faces, the resulting point is stored and the instrument is returned to the first face.

This hotkey is only available in the Survey program for **<EDM Type: Reflector (RL)>** or **<EDM Type: Reflctrless (IR)>**.

SHIFT INDIV (F5) and **SHIFT RUN (F5)**

To change between entering an individual point ID different to the defined ID template and the running point ID according to the ID template. Refer to "15.1 ID Templates".

Description of fields

Field	Option	Description
<Point ID:>	User input	The identifier for measured points. The configured point ID template is used. The ID can be changed: • To start a new sequence of point ID's overtype the point ID. • For AN individual number independent of the ID template **SHIFT INDIV (F5)**. **SHIFT RUN (F5)** changes back to the next ID from the configured ID template. Refer to "15.1 ID Templates".

Field	Option	Description
<Reflector Ht:>	User input	The last used reflector height is suggested when accessing the Survey application program. An individual reflector height can by typed in.
<Hz:>	Output	The current horizontal angle.
<V:>	Output	The current vertical angle.
<Horiz Dist:>	Output	The horizontal distance after **DIST (F2)** was pressed. No distance is displayed when accessing the screen and after **REC (F3)** or **ALL (F1)**.
<Ht Diff:>	Output	The height difference between station and measured point after **DIST (F2)**. Displays ----- when accessing the screen and after **REC (F3)** or **ALL (F1)**.
<Easting:>	Output	Easting coordinate of the measured point.
<Northing:>	Output	Northing coordinate of the measured point.
<Height:>	Output	Elevation of the measured point.

Next step
PAGE (F6) changes to another page on this screen.

36 Survey - Auto Points

36.1 Overview

Description

- Auto points is used to automatically measure and store points at a specific rate. Additionally, individual auto points can be stored outside the defined rate. Auto points logged between starting and stopping logging of auto points form one chain. A new chain is formed each time logging of auto points is started.
- Auto points can be collected in the Survey application program. An **Auto** page is visible when logging of auto points is active.
- Up to two offset points related to one auto point can be logged. The offset points can be both to the left or right and they can be coded independently of each other and of the auto points. Refer to "36.4 Offset Points of Auto Points".

Coding of auto points

Coding of auto points is similar to coding of measured points. Refer to "9 Coding" for information on coding.
The differences are:

- Thematical coding: Always available.
- Free coding: Always available.
- Quick coding: Not available.
- Codes of auto points overwrite the codes of points existing in the active job with the same point ID but with a different code as the auto point.
- Codes of auto points can be changed when no auto points are being logged.
- Up to three attributes can be stored with a code

Properties of auto points

The properties stored with auto points are:

- Class: **MEAS**
- Sub class: **TPS**
- Source: **Survey (Auto)** or **Survey (Auto Of)**
- Instrument source: **TPS**

Averaging of auto points

An average is never calculated for auto points even if a measured point of class **MEAS** already exists with the same point ID.

36.2 Configuring Auto Points

Access

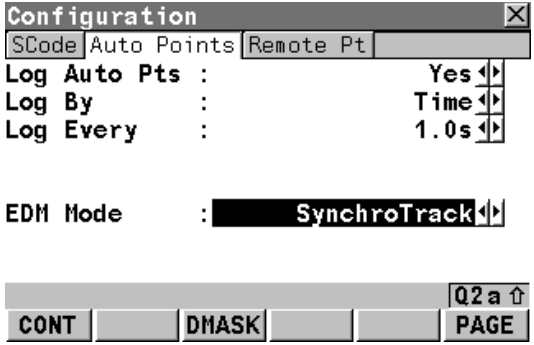
Select **Main Menu: Survey**. In **SURVEY Survey Begin** press **CONF (F2)** to access **SURVEY Configuration**.

OR

In **SURVEY Survey: Job Name** press **SHIFT CONF (F2)** to access **SURVEY Configuration**.

SURVEY Configuration, Auto Points page

The settings on this page activate the logging of auto points and define the method of logging.



CONT (F1)
To accept changes and return to the screen from where this screen was accessed.

DMASK (F3)
Available for **<Log Auto Pts: Yes>**. To configure what is viewed in the **Auto** page in the Survey application program. Refer to paragraph "SURVEY Configure Auto Pts Display Mask".

PAGE (F6)
To change to another page on this screen.

Description of fields

Field	Option	Description
<Log Auto Pts:>	**Yes**	Activates logging of auto points. ☞ All other fields on the screen are active and can be edited with this setting.

Field	Option	Description
	No	Deactivates logging of auto points and all fields on this screen.
<Log By:>	**Time**	Auto points are stored according to a time interval.
	Distance	The difference in distance from the last stored auto point, which must be reached before the next auto point is measured. The auto point is stored with the next available measured position.
	Height Diff	The height difference from the last stored auto point, which must be reached before the next auto point is measured. The auto point is stored with the next available measured position.
	Dist or Ht	Before the next auto point is measured, either the difference in distance or the difference in height must be reached. The auto point is stored with the next available measured position.
	Stop & Go	An auto point is stored when the position of the reflector does not move more than the distance configured in **<Stop Position:>** within the **<Stop Time:>**. Once a point has been stored, the position from the point just stored must change more than the distance configured in **<Stop Position:>** before he routine starts again.

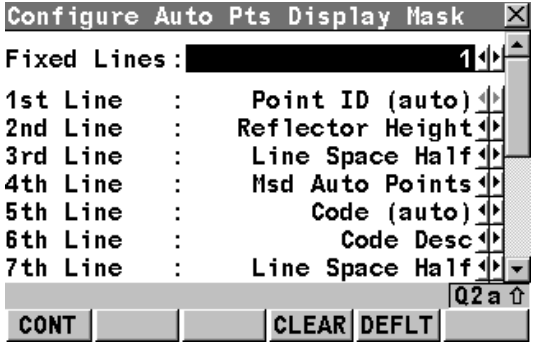
Field	Option	Description
	User Decides	An auto point is stored upon pressing **REC (F3)** in **SURVEY Survey: Job Name, Auto** page. In the beginning, the chain to which the auto points should be assigned must be started with **START (F1)**. In the end, the chain must be closed with **STOP (F1)**.
<Log Every:>	For **<Log By: Time>** from **0.1s** to **60.0s**	Available when: • **<Log By: Time>** • **<Log By: Distance>** • **<Log By: Height Diff>**. For **<Log By: Time>**. The time interval before the next auto point is logged.
<Min Distance:>	User input	Available for **<Log By: Dist or Ht>**. The value for the difference in distance before the next auto point is logged.
<Min Height:>	User input	Available for **<Log By: Dist or Ht>**. The value for the height difference before the next auto point is logged.
<Stop Position:>	User input	Available for **<Log By: Stop & Go>**. The maximum distance within which the position is considered stationary.
<Stop Time:>	User input	Available for **<Log By: Stop & Go>**. The time while the position must be stationary until an auto point is stored.

Field	Option	Description
<EDM Mode:>	**Tracking**	Continuous distance measurement with 0.3 s measuring time and 5 mm + 2 ppm accuracy. When the logging of auto points has started, **TRK** is displayed as an icon.
	SynchroTrack	Available only for **<EDM Type: Reflector (IR)>**. This is the measurement mode for the interpolation of angle measurements in IR tracking mode. In difference to normal IR tracking mode, where angle measurements are only assigned to certain distance measurements, SynchroTrack will perform a linear interpolation between the previous and following angle measurement, based upon the timestamp of the EDM measurement. When the logging of auto points has started, **SYNC** is displayed as an icon.

Next step

IF the display mask	THEN
is not to be configured	**CONT (F1)** closes the screen and returns to the screen from where **SURVEY Configuration, Auto Points** page was accessed.
is to be configured	**DMASK (F3)**. Refer to paragraph "SURVEY Configure Auto Pts Display Mask".

SURVEY
Configure Auto Pts
Display Mask


Configure Auto Pts Display Mask
Fixed Lines : 1
1st Line : Point ID (auto)
2nd Line : Reflector Height
3rd Line : Line Space Half
4th Line : Msd Auto Points
5th Line : Code (auto)
6th Line : Code Desc
7th Line : Line Space Half
Q2a
CONT
CLEAR
DEFLT

CONT (F1)
To accept changes and return to the screen from where this screen was accessed.

CLEAR (F4)
To set all fields to **<XX. Line: Line Space Full>**.

DEFLT (F5)
Available if the active configuration set is a default configuration set. To recall the default settings.

Description of fields

Field	Option	Description
<Fixed Lines:>	From **0** to **5**	Defines how many lines do not scroll in **SURVEY Survey: Job Name, Auto** page when that display mask is used.
<1st Line:>	Output	Fixed to **<1st Line: Point ID (auto)>**.
<2nd Line:> to **<16th Line:>**	**Add. Constant**	Output field for the additive constant of the currently selected reflector.
	Angle Right	Output field for the angle right.
	Annotation 1-4	Input field for comments to be stored with the point.
	Attrib (free) 01-20	Output field for attributes for free codes.

Field	Option	Description
	Attrib (pt) 01-03	Input field for attributes for point codes.
	Azimuth	Output field for the azimuth.
	Code (auto)	Choicelist or input field for auto point codes.
	Code (free)	Output field for free codes.
	Code Desc	Output field for the description of codes.
	Code Desc (free)	Output field for the description of free codes.
	Code Type	Output field for the description of point codes.
	EDM Mode	Output field displaying the current EDM mode.
	EDM Type	Output field displaying the current EDM type.
	Easting	Output field for the Easting coordinate of the measured point.
	Height	Output field for the height coordinate of the measured point
	Height Diff	Output field for the height difference between station and reflector.
	Horiz Dist	Output field for the horizontal distance calculated from the measured slope distance and the vertical angle.
	Hz-Angle	Output field for the horizontal angle.
	Line Space Full	Insert full line space.

Field	Option	Description
	Line Space Half	Insert half line space.
	Longitudinal Tilt	Output field for the longitudinal tilt of the vertical axis.
	Msd Auto Points	Output field for the number of auto points logged after pressing **START (F1)** in **SURVEY Survey: Job Name, Auto** page. Counting starts from 0 every time **START (F1)** is pressed.
	Northing	Output field for the North coordinate of the measured point.
	Offset Cross	Input field for the horizontal distance offset for the measured point, perpendicular to the line of sight.
	Offset Height	Input field for the height offset of the measured point.
	Offset Length	Input field for the horizontal distance offset, in the direction of line of sight.
	Reflector	Output field for the chosen reflector.
	Reflector Height	Input field for the reflector height.
	SD-Last Rec	Output field for the last recorded distance.
	Slope Dist	Output field for the measured slope distance.
	Transversal Tilt	Output field for the transversal tilt of the vertical axis.

Field	Option	Description
	V-Angle	Output field for the vertical angle.

Next steps

Step	Description
1.	**CONT (F1)** closes the screen and returns to **SURVEY Configuration, Auto Points** page.
2.	**CONT (F1)** returns to the screen from where **SURVEY Configuration, Auto Points** page was accessed.

36.3 Auto Points

Requirements

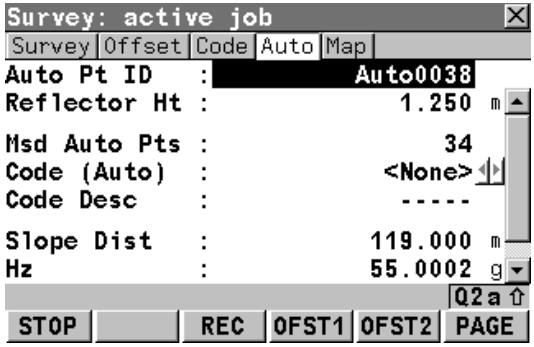
<Log Auto Pts: Yes> in **SURVEY Configuration, Auto Points** page.

Access step-by-step

Step	Description
1.	Refer to "35.1 Accessing Survey" to access **SURVEY Survey Begin**.
2.	**SURVEY Survey Begin** Check the settings.
3.	**CONT (F1)** to access **SURVEY Survey: Job Name**.
4.	**PAGE (F6)** until the **Auto** page is visible.

SURVEY Survey: Job Name, Auto page

The **Auto** page of a typical configuration set is explained. Before logging of auto points has started, the page appears as shown below:



START (F1)

To start logging of auto points and offset points if configured or, for **<Log By: User Decides>** to start the chain to which the auto points should be assigned. The first auto point is stored. **<EDM Mode: Tracking>** becomes active. For **<EDM Type: Reflector (IR)>** instrument locks onto reflector. For **<EDM Type: Long Range (LO)> <EDM Type: Reflector (IR)>** is set and instrument locks onto the reflector.

STOP (F1)

To end recording of auto points and offset points if configured or, for **<Log By: User Decides>**, to end the chain to which the auto points are assigned..

REC (F3)

Available for **STOP (F1)**. To store an auto point at any time.

OFST1 (F4)

To configure recording of the first type of offset points. Refer to "36.4 Offset Points of Auto Points".

OFST2 (F5)

To configure recording of a second type of offset points. Refer to "36.4 Offset Points of Auto Points".

PAGE (F6)

To change to another page on this screen.

SHIFT CONF (F2)

To configure auto points. Refer to "36.2 Configuring Auto Points".

SHIFT QUIT (F6)

To exit the Survey application program. Point information logged until pressing **SHIFT QUIT (F6)** is saved in the database.

Description of fields

Field	Option	Description
<Auto Pt ID:>	User input	Available unless **<Auto Pts: Time & Date>** in **CONFIGURE ID Templates**. The identifier for auto points. The configured ID template for auto points is used. The ID can be changed. To start a new sequence of point ID's overtype the point ID.
	Time and Date	Available for **<Auto Pts: Time & Date>** in **CONFIGURE ID Templates**. The current local time and date is used as identifier for auto points.
<Reflector Ht:>	User input	The default reflector height as defined in the active configuration set is suggested.
<Msd Auto Pts:>	Output	Available after pressing **START (F1)** and before pressing **STOP (F1)**. The number of auto points measured since **START (F1)** has been pressed.
<Code (Auto):>		The thematical code for the auto point. • If a point code is selected then any open line/area is closed. The occupied point is stored with the selected code idependently of any line/area.

Field	Option	Description
		• If a line code is selected then any open line is closed and a new line with the selected code is created. The line ID is defined by the configured line ID template. The occupied point is assigned to that line. The line stays open until it is closed manually or another line code is selected. • If an area code is selected then the behaviour is as for lines.
	Choicelist	Available for **<Thematc Codes: With Codelist>**. The setting for **<Show Codes:>** in **CONFIGURE Coding & Linework** determines if either all codes or only point codes are available. The attributes are shown as output, input or choicelist fields depending on their definition.
	User input	Available for **<Thematc Codes: Without Codelist>**. Codes can be typed in but not selected from a codelist. A check is performed to see if a code of this name already exists in the job. If so, the according attributes are shown. Configure a display mask with a choicelist for code types to define if a point, line or area code is typed in.
<Code Desc:>	Output	The description of the code.

Field	Option	Description
<Slope Dist:>	Output	The measured slope distance. When **START (F1)** is pressed, **<EDM Mode: Tracking>** is set and the slope distance is constantly updated.
<Hz:>	Output	The current horizontal angle.
<V:>	Output	The current vertical angle.

Next step

IF	THEN
auto points are to be logged	**START (F1)**. Then, for <Log By: User Decides>, **REC (F3)** whenever an auto point is to be stored.
offset points are to be configured	**OFST1 (F4)** or **OFST2 (F5)**. Refer to "36.4 Offset Points of Auto Points".

36.4 Offset Points of Auto Points

36.4.1 Overview

Description

Offset points

- can be created with auto points when auto points are stored to the database.
- can be to the left or to the right of auto points.
- are automatically computed with the logging of auto points, if configured.
- form a chain relative to the chain of auto points to which they are related. Subsequently computed chains are independent from each other.
- can be coded independently of auto points.
- have the same time of when they were stored as the auto points to which they are related.
- have the same coding functionality, properties and averaging functionality as auto points. Refer to "36.1 Overview".

Up to two offset points can be related to one auto point.
The screens for the configuration of offset points are identical except for the title **Auto Points - Offset 1** and **Auto Points - Offset 2**. For simplicity, the title **Auto Points - Offset** is used in the following description.

Computation of offset points

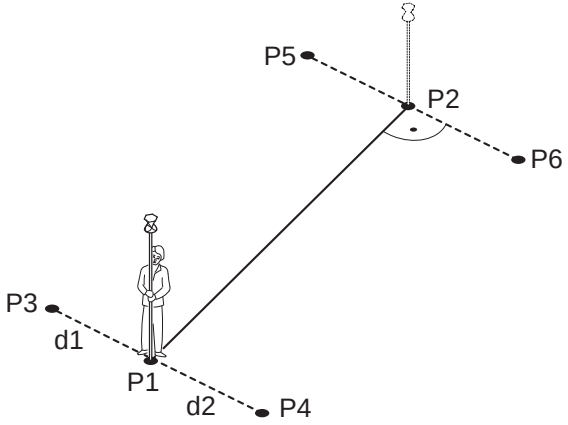
The computation of offset points depends on the number of auto points in one chain.

One auto point

No offset points are computed or stored.

Two auto points

The configured offsets are applied perpendicular to the line between two auto points.



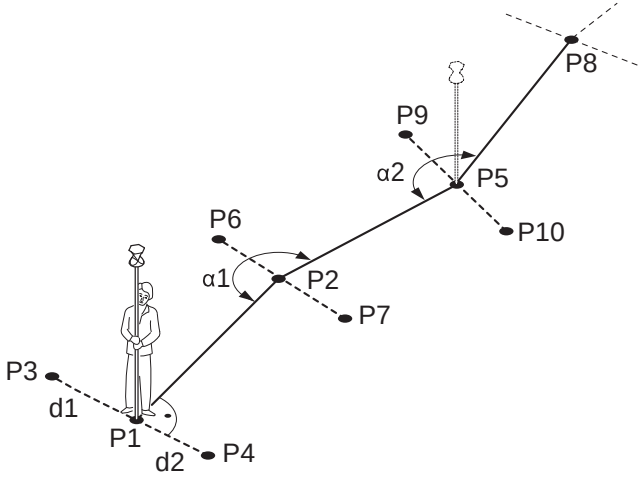
P1 First auto point
P2 Second auto point
P3 First offset point for P1
P4 Second offset point for P1
P5 First offset point for P2
P6 Second offset point for P2
d1 Horizontal offset to the left
d2 Horizontal offset to the right

Three or more auto points

The first offset points are computed perpendicular to the line between the first and the second auto point.

The last offset point is computed perpendicular to the line between the last auto point and the one before.

All other offset points are computed on a bearing. The bearing is half of the angle between the last and the next measured auto point.



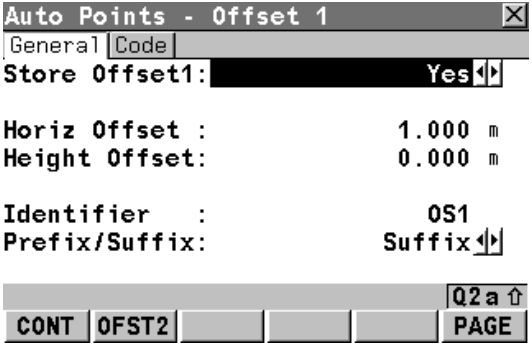
P1	First auto point
P2	Second auto point
P3	First offset point for P1
P4	Second offset point for P1
P5	Third auto point
P6	First offset point for P2
P7	Second offset point for P2
P8	Fourth auto point
P9	First offset point for P5
P10	Second offset point for P5
d1	Horizontal offset to the left
d2	Horizontal offset to the right
α1	Angle between P1 and P5
α2	Angle between P2 and P8

36.4.2 Configuring Offset Points

Access step-by-step

Step	Description
1.	Refer to "35.2 Surveying Points" to access **SURVEY Survey: Job Name**.
2.	**PAGE (F6)** until the **Auto** page is active.
3.	**OFST1 (F4)** or **OFST2 (F5)** to access **SURVEY Auto Points - Offset**.

SURVEY Auto Points - Offset, General page



CONT (F1)
To accept changes and return to the screen from where this screen was accessed.

OFST2 (F2) and **OFST1 (F2)**
To switch between configuring offset point type one and two.

PAGE (F6)
To change to another page on this screen.

Description of fields

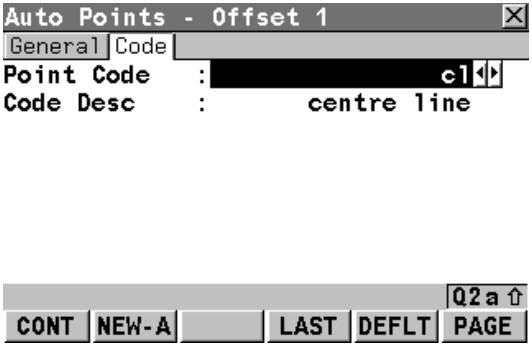
Field	Option	Description
<Store Offset1:> and **<Store Offset2:>**	**Yes**	Activates logging of offset points. ☞ All other fields in the screen are active and can be edited with this setting.
	No	Deactivates logging of offset points and all fields in this screen.
<Horiz Offset:>	User input	The horizontal offset between -1000 m and 1000 m at which the offset point is collected.
<Height Offset:>	User input	The height offset between -100 m and 100 m from the related auto point.
<Identifier:>	User input	The identifier with up to four characters is added in front of or at the end of the ID of the auto point. This ID is then used as the point ID for the related offset point. This could support an automatic workflow into CAD packages including setting symbols and stringing lines.
<Prefix/Suffix:>	**Prefix**	Adds the setting for **<Identifier:>** in front of the auto point ID.
	Suffix	Adds the setting for **<Identifier:>** at the end of the auto point ID.

Next step

PAGE (F6) changes to the **Code** page.

SURVEY
Auto Points - Offset, Code page

The setting for **<Thematc Codes:>** in **CONFIGURE Coding & Linework** determines the availability of the fields and softkeys.



CONT (F1)
To accept changes and return to the screen from where this screen was accessed.

NEW-A (F2)
Available for **<Thematc Codes: With Codelist>**. To create additional attributes for the selected **<Point Code:>**.

NAME (F3) or **VALUE (F3)**
Available for **<Thematc Codes: With Codelist>**. Available for attributes for which an attribute name can be typed in. To highlight **<Attribute n:>** or the field for the attribute value. The name of **<Attribute n:>** can be edited and an attribute value can be typed in.

LAST (F4)
Available for **<Thematc Codes: With Codelist>**. To recall the last used attribute values for the selected code.

DEFLT (F5)
Available for **<Thematc Codes: With Codelist>**. To recall the default attribute values for the selected code.

PAGE (F6)
To change to another page on this screen.

Description of fields

Field	Option	Description
<Point Code:>	Choicelist	The thematical code for the offset point. Available for **<Thematc Codes: With Codelist>**. The setting for **<Show Codes:>** in **CONFIGURE Coding & Linework** determines if either all codes or only point codes are available. The attributes are shown as output, input or choicelist fields depending on their definition.
<Code:>	User input	The thematical code for the offset point. Available for **<Thematc Codes: Without Codelist>**. Codes can be typed in but not selected from a codelist. A check is performed to see if a point code of this name already exists in the job. If so, the according attributes are shown.
<Code Desc:>	Output	Available for **<Thematc Codes: With Codelist>**. The description of the code.
<Attribute n:>	User input	Available for **<Thematc Codes: Without Codelist>**. Up to three attribute values can be stored.

Next step

IF	THEN
offset point configuration is finished	**CONT (F1)** to return to **SURVEY Survey: Job Name**.

IF	THEN
a second offset point is to be configured	**PAGE (F6)** and then **OFST2 (F2)** or **OFST1 (F2)** to change to **SURVEY Auto Points - Offset** for the second point.

Example for offset point ID's

The offset point ID is a combination of the auto point ID and an identifier as prefix or suffix. The right most part of the auto point ID is incremented within the point ID. The auto point ID is truncated from the left if the length of the auto point ID plus identifier prefix or suffix is greater than 16 characters.

Auto point ID	Identifier	Prefix/Suffix	Offset point ID
Auto1234 Auto1235	OS1	Prefix	OS1Auto1234 OS1Auto1235 ...
Auto1234 Auto1235	OS1	Suffix	Auto1234OS1 Auto1235OS1 ...

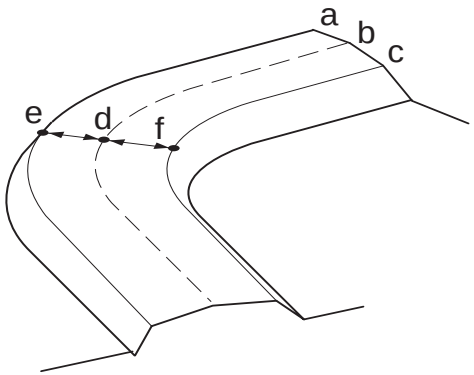
Refer to "15.1 ID Templates" for more information on point ID's.

36.4.3 Working Example

Description

Application:	Pick up points along the centreline, to the right and to the left of a road.
Goal:	Points are to be picked up automatically every 5 m while walking along the centreline. The points to the right and to the left of the road are to be picked up automatically with those of the centreline. The auto point ID's are CL0001, CL0002,.... The offset point ID's are OSCL0001, OSCL0002,... for the right side of the road and CL0001OS, CL0002OS,... for the left side. The offset to the right and to the left is 3 m. The height difference is -0.3 m to the right and 0.3 m to the left.

Diagram



a) Left side of the road
b) Centreline
c) Right side of the road
d) CL0001
e) OSCL0001
f) CL0001OS

- The default display mask for **SURVEY Survey: Job Name**, **Auto** page is used.
- **<Distance Unit: Metres (m)>** in **CONFIGURE Units & Formats**, **Units** page.
- An ID template for the auto points is configured. Refer to "15.1.6 Working Example" for information on how to configure ID templates.

Field procedure step-by-step

Step	Description
1.	**Main Menu: Survey**.
2.	**SURVEY Survey Begin** Select a job, a reflector and a configuration set with the settings mentioned above.
3.	**CONF (F2)** to access **SURVEY Configuration**.
4.	**SURVEY Configuration**, **Auto Points** page **<Log Auto Pts: Yes>** **<Log By: Distance>** **<Log Every: 5.0000>**
5.	**CONT (F1)** to return to **SURVEY Survey Begin**.
6.	**CONT (F1)** to access **SURVEY Survey: Job Name**.
7.	**PAGE (F6)** until the **Auto** page is active.
8.	**OFST1 (F4)** to configure the offset points for the right side of the road.
9.	**SURVEY Auto Points - Offset 1, General** page **<Store Offset1: Yes>** **<Horiz Offset: 3.0000>** **<Height Offset: -0.3000>**

Step	Description
	<Identifier: OS> **<Prefix/Suffix: Prefix>**
10.	**OFST2 (F2)** to configure the offset points for the left side of the road.
11.	**SURVEY Auto Points - Offset 2, General** page **<Store Offset2: Yes>** **<Horiz Offset: -3.0000>** **<Height Offset: 0.3000>** **<Identifier: OS>** **<Prefix/Suffix: Suffix>**
12.	**CONT (F1)** closes the screen and returns to **SURVEY Survey: Job Name**, **Auto** page.
13.	**SURVEY Survey: Job Name**, **Auto** page **START (F1)** starts logging of auto points and offset points.
14.	Walk along the centreline of the road as far as points need to be picked up.
☞	**OFST1 (F4)** to change the offset or the height difference between the auto points on the centreline and the right side of the road.
☞	**OFST2 (F5)** to change the offset or the height difference between the auto points on the centreline and the left side of the road.
15.	**STOP (F1)** ends recording of auto points and offset points.
☞	The stopping measuring auto points is indicated in the EDM icon.

Step	Description
16.	After finishing the survey, import the data into a CAD package. If the offset point ID's or codes fulfill the requirements of the CAD package, the offset points to the right and to the left of the road are automatically strung together.

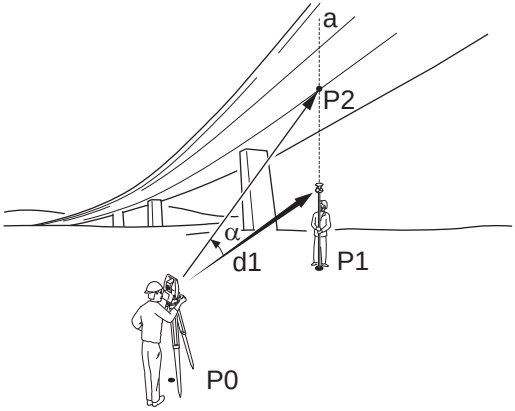
37 Survey - Remote Point

37.1 Overview

Description

Remote point is used to determine the 3D coordinates of inaccessible points, for example on bridges. The horizontal distance to a base point directly underneath or above the remote point is measured. Then the instrument is aimed at the remote point. The coordinates of the remote point are calculated with the distance measured to the base point and the angles measured to the remote point.

Diagram



P0 Instrument station
P1 Base point
P2 Remote point
d1 Horizontal distance to the base point
α Vertical angle between base point and remote point
a Vertical axis from P1 to P2

To ensure correct results, the remote point and the reflector must be lined up vertically. If it is not possible to maintain an exactly vertical line, the acceptable **<Hz Dist Tol:>** must be chosen. The horizontal distance to the remote point and to the base point should coincide.

Properties of remote points

The properties stored with auto points are:

- Class: **MEAS**
- Sub class: **TPS**
- Source: **Survey (Rem Pt)**
- Instrument source: **TPS**

Averaging of remote points

An average can be calculated for remote points if a measured point of class MEAS already exists with the same point ID. The average flag for the point is **AUTO**.

37.2 Accessing Remote Point

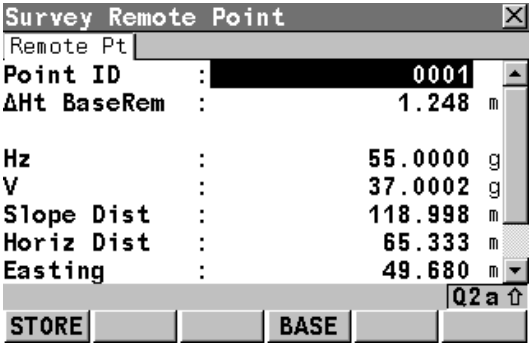
Remote point measurements are possible from the Survey application program when **<Use Remote Pt: Yes>** is set in the **SURVEY Configuration, Remote Pt** page and a valid distance measurement is available. Refer to "37.3 Configuring Remote Point".

☞ Unless **<Display Mask: None>** in **SURVEY Configuration, Remote Pt** page, this screen contains an additional, user defined display mask.

Access

REMOT (F4) in **SURVEY Survey: Job Name** after one point is measured.

SURVEY
Survey Remote Point,
Remote Pt page



STORE (F1)
Stores the remote point. Stays in the **SURVEY Survey Remote Point** screen.

BASE (F4)
Returns to **SURVEY Survey: Job Name**. The distance measurement is cleared.

Description of fields

Field	Option	Description
<Point ID:>	User input	Displays the point ID for the remote point. The point ID in **SURVEY Survey Remote Point** is always identical to the point ID in **SURVEY Survey: Job Name**.
<ΔHt BasRem:>	Output	The elevation difference between the base point and the remote point.
<Hz:>	Output	The current horizontal angle.
<V:>	Output	The current vertical angle.
<Slope Dist:>	Output	The current slope distance to the remote point calculated from the horizontal distance to the base point and the current vertical angle.
<Horiz Dist:>	Output	The horizontal distance measured to the base point.
<Easting:>	Output	Calculated Easting coordinate for the remote point.
<Northing:>	Output	Calculated Northing coordinate for the remote point.
<Height:>	Output	Calculated height for the remote point.

Next step

IF	THEN
if a remote point is to be stored	**STORE (F1)**.
a new base point is to be measured	**BASE (F4)** to return to **SURVEY Survey: Job Name**.

37.3 Configuring Remote Point

Access

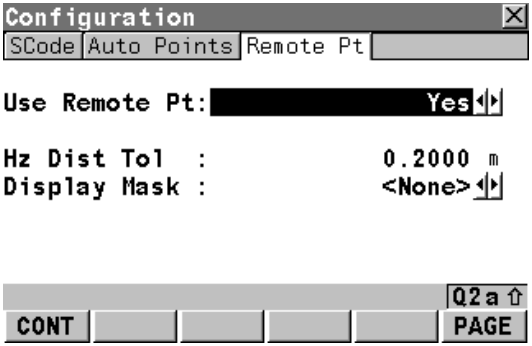
Select **Main Menu: Survey**. In **SURVEY Survey Begin** press **CONF (F2)** to access **SURVEY Configuration**. **PAGE (F6)** until the **Remote Pt** page is active.

OR

In **SURVEY Survey: Job Name** press **SHIFT CONF (F2)** to access **SURVEY Configuration**. **PAGE (F6)** until the **Remote Pt** page is active.

SURVEY Configuration, Remote Pt page

The settings on this screen activate the remote point function.



CONT (F1)
To accept changes and return to the screen from where this screen was accessed.

DMASK (F3)
Accesses **CONFIGURE Define Display Mask n**. Available for **<Display Mask:>** being highlighted. Refer to "15.2 Display Settings".

Description of fields

Field	Option	Description
<Use Remote Pt:>	**Yes**	Activates the remote point function. **REMOT (F4)** is added to the function keys in **SURVEY Survey: Job Name**.
	No	Deactivates the remote point function, **REMOT (F4)** is not available in **SURVEY Survey: Job Name**.
<Hz Dist Tol:>	User input	The horizontal distance to the remote point is equal to the horizontal distance of the base point. The value for **<Hz Dist Tol:>** is the maximum tolerated length of the chord between the base point and the remote point.
<Display Mask:>	Choicelist	Displays **<None>** until a display mask is chosen. All display masks from **Main Menu: Config...\Survey Settings...\Display Settings** can be selected.

Next step
CONT (F1) to return to the screen **SURVEY Configuration** was accessed from.

37.4 Working Example

Description

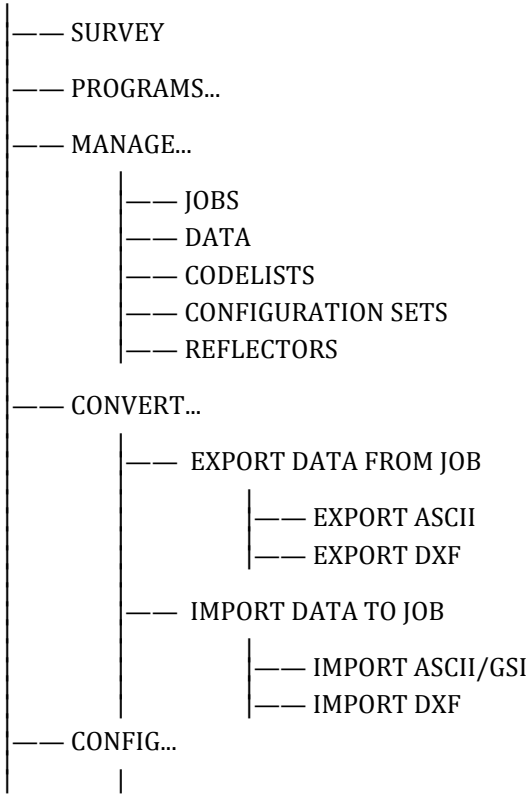
Application:	Pick up points along a bridge. The points to be measured are not directly accessible with a reflector.
Working technique:	Remote point surveying.
Settings:	**<Use Remote Pt: Yes>** in the **SURVEY Configuration, Remote Pt** page.

Measuring remote points step-by-step

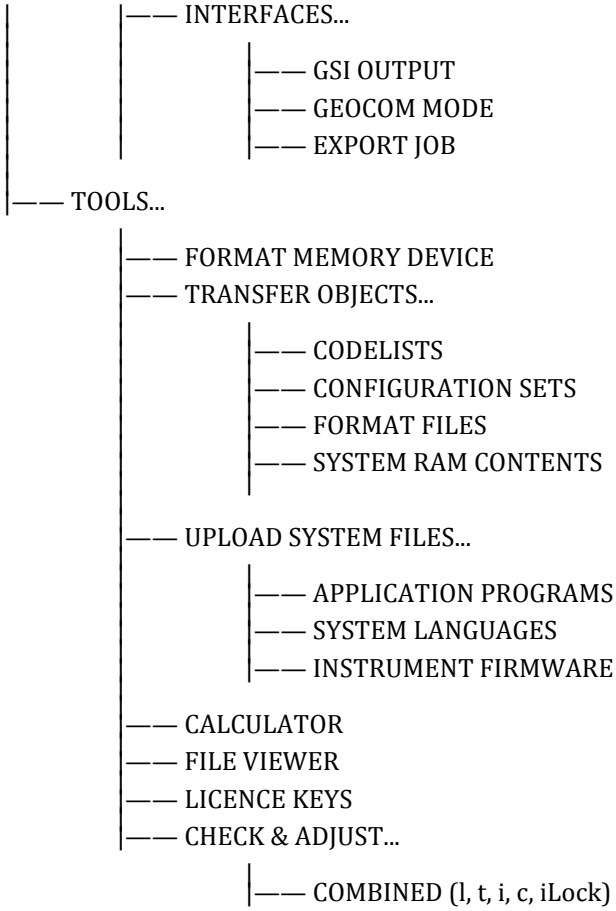
Step	Description
☞	The reflector height at the base point is always applied in the calculation of the base point elevation. For the calculation of the remote point elevation the reflector height is automatically set to zero.
1.	Aim at the reflector that is placed at the base point, which is directly underneath the remote point to be measured.
2.	**SURVEY Survey: Job Name** **DIST (F2)** to measure the horizontal distance to the base point.
3.	**REMOT (F4)**.
4.	Aim at the remote point to be measured.
5.	**SURVEY Survey Remote Point, Remote Pt** page **STORE (F1)** to measure and store the angle measurements and calculated coordinates for the remote point.
6.	**BASE (F4)** to return to **SURVEY Survey: Job Name** and measure a new base point.

Appendix A Menu Tree

Menu tree



- SURVEY SETTINGS...
  - ID TEMPLATES
  - DISPLAY SETTINGS
  - CODING & LINEWORK SETTINGS
  - OFFSETS
  - TARGET CHECK
- INSTRUMENT SETTINGS...
  - EDM & iLock SETTINGS
  - SEARCH WINDOWS
  - AUTOMATIC PRISM SEARCH
  - TPS CORRECTIONS
  - COMPENSATOR
  - INSTRUMENT ID
  - TELESCOPE ACCESSORIES
- GENERAL SETTINGS...
  - UNITS & FORMATS
  - WIZARD MODE
  - USER MENU
  - LANGUAGE
  - LIGHTS, DISPLAY, BEEPS, TEXT
  - START UP & POWER DOWN


INTERFACES...
GSI OUTPUT
GEOCOM MODE
EXPORT JOB
TOOLS...
FORMAT MEMORY DEVICE
TRANSFER OBJECTS...
CODELISTS
CONFIGURATION SETS
FORMAT FILES
SYSTEM RAM CONTENTS
UPLOAD SYSTEM FILES...
APPLICATION PROGRAMS
SYSTEM LANGUAGES
INSTRUMENT FIRMWARE
CALCULATOR
FILE VIEWER
LICENCE KEYS
CHECK & ADJUST...
COMBINED (l, t, i, c, iLock)

—— TILTING AXIS (a)
—— COMPENSATOR (l, t)
—— CURRENT VALUES
—— END CHECK & ADJUST

Appendix B Memory Types

Types of memory available

CompactFlash card

- Jobs
  - Points
  - Codes
- TPS raw observations
- ASCII output files
- Logfiles
- ASCII files to be imported (CompactFlash card)

The information is managed in the job database and in the measurement database.

Application programs memory, 8 MB	**System RAM, 1 MB**
• System language	• Codelists
• Font files	• Configuration sets
• Application programs	• Format files
• Language files	• ID templates
• Font files	• Sort and filter settings

Appendix C Directory Structure of the Memory Device

Description

On the memory device, files are stored in certain directories.

Directory structure

├── CODE	• Codelists various files
├── CONFIG	• TPS configuration files (*.xfg)
├── CONVERT	• Format files (*.frt)
├── DATA	• ASCII files for import/export to/from job (*.*) • DXF files for import/export to/from job (*.*) • Logfiles created from application programs
├── DBX	• Job files, various files • DTM jobs, various files
├── GSI	• GSI files (*.gsi) • ASCII files for export from job (*.*)

|—— SYSTEM	• Application program files (*.a*) • Firmware files (*.fw) • Language files (*.s*) • Licence file (*.key) • System files (System.ram)

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°DMS 360

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